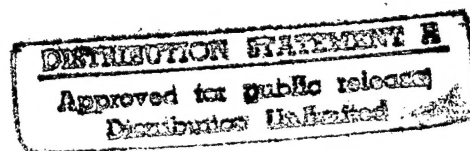


# Limited Energy Study (Glass)

## Energy Engineering Analysis Program (EEAP) Fort Knox, Kentucky

### *Final Report Volume 2 of 3*

CONTRACT #DACA01-94-D-0034  
SYSTEMS CORP PROJECT #94013.02  
OCTOBER 28, 1994



Louisville District-  
US Army Corps  
of Engineers

19971016 187

**SYSTEMS***corp*

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**SYSTEMS ENGINEERING AND MANAGEMENT CORPORATION**  
Cherokee Place, Suite 306 ♦ 2200 Sutherland Avenue ♦ Knoxville, Tennessee 37919  
Telephone 615-521-6536 Fax 615-524-7514




DEPARTMENT OF THE ARMY  
CONSTRUCTION ENGINEERING RESEARCH LABORATORIES, CORPS OF ENGINEERS  
P.O. BOX 9005  
CHAMPAIGN, ILLINOIS 61826-9005

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Marie Wakefield,  
Librarian Engineering

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(Includes FEMP Project 3)

## 4 ECIP PROJECT 2: INFRA-RED HEAT AT 31 BUILDINGS

FY94 LIMITED ENERGY STUDY (GLASS), FT. KNOX, KY

This section contains the project description and the DD 1391 Forms for ECIP Project 2: Infra-red Heat at 31 buildings. Following the DD 1391 Forms is a project summary table, the life cycle cost analysis for the project, and the life cycle cost analysis, cost estimates, and calculations for each building/area included in the project. This ECIP project also includes an FEMP project. This FEMP project is referred to as FEMP Project 3 and includes buildings 2762-2767, 2778, 2781, 2770, 2942-2944. Below is a detailed index of the information included in this section.

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DATE 28 October 1994  
PROJECT NO.: ECIP 2  
PROJECT TITLE: ECIP - Heating Systems  
INSTALLATION: Fort Knox  
LOCATION: Kentucky

PRIMARY FACILITY  
Infrared Heating Systems

\$ 1,786,000

ESTIMATED CONTRACT COST  
CONTINGENCY PERCENT (10%)  
SUBTOTAL  
SUPERVISION, INSPECTION & OVERHEAD (5%)  
DESIGN (5%)  
TOTAL REQUEST  
TOTAL REQUEST (ROUNDED)

\$ 1,475,763  
\$ 147,576  
\$ 1,623,339  
\$ 81,167  
\$ 81,167  
\$ 1,785,673  
\$ 1,786,000

Modernize heating systems in 31 high and low bay buildings on Fort Knox with infra-red heaters. This project will perform the following energy engineering improvements to the heating systems.

1). Replace the existing hot water and steam heating systems with infra-red heaters. This includes all areas heated by the existing boiler systems in the 31 buildings. Construction costs include the demolition of the existing heating systems.

2). All infra-red heating systems will be natural gas with electric ignition. The construction costs include bring the natural gas distribution systems to the buildings currently served by fuel oil. This will eliminate the need for underground fuel tanks at these 31 facilities.

DATE 28 October 1994  
PROJECT NO.: ECIP 2  
PROJECT TITLE: ECIP - Heating Systems  
INSTALLATION: Fort Knox  
LOCATION: Kentucky

PROJECT:

Modernize heating systems in 31 high and low bay buildings on Fort Knox with infra-red heaters.

REQUIREMENTS:

Fort Knox operates numerous buildings with outdated, inefficient heating systems. The low efficiency on the existing systems allows wasted usage throughout the heating seasons. These inefficient heating systems drive up the consumption of fuel oil and increase the dependency on foreign oil supplies. The US Army Corps of Engineers, Louisville District, contracted an Energy Engineering Analysis Program to study the heating systems in 31 buildings on Fort Knox. The study identified energy conservation opportunities and performed a life-cycle cost analysis on each opportunity to determine its discounted savings-to-investment ratio (SIR) and estimated payback period. This project capitalizes on identified energy savings opportunities with an SIR greater than 1.25 and a payback period of no more than 10 years.

CURRENT SITUATION:

Numerous Fort Knox facilities currently operate with inefficient heating systems. Many of the buildings in this project are high-bay maintenance facilities with hot water and steam unit heaters. Many of these buildings set the thermostats at 65 to 75°F in the effort to keep occupants warm. These facilities consume more energy than is necessary for their operation. Many of these facilities use fuel oil as their fuel source. Natural gas is a less expensive and cleaner fuel source.

IMPACT IF NOT PROVIDED:

If this project is not provided, 31 buildings will continue to operate with inefficient heating systems, consuming unnecessary energy. The U.S. Army will fail to realize an estimated \$258K in annual savings (FY95\$) and a total discounted savings of \$5.1M in the twenty year life of the project.

ADDITIONAL:

A life cycle cost analysis was performed on each portion of this project and on the overall project. The overall project will realize an energy savings worth over 2.5 times the initial investment cost and will pay for itself in less than 6.9 years.

Fort Knox is not on the list of installations considered for closure or realignment.

DATE 28 October 1994  
PROJECT NO.: ECIP 2  
PROJECT TITLE: ECIP - Heating Systems  
INSTALLATION: Fort Knox  
LOCATION: Kentucky

SECTION 11 - ECONOMIC ANALYSIS DATA

11D ECONOMIC JUSTIFICATION SUMMARY

This energy conservation project is recommended for funding. A life cycle cost analysis was performed on each portion of this project and on the overall project. The overall project will realize an energy savings worth over 2.5 times the initial investment cost and will pay for itself in less than 6.5 years.

DATE 28 October 1994  
PROJECT NO.: ECIP 2  
PROJECT TITLE: ECIP - Heating Systems  
INSTALLATION: Fort Knox  
LOCATION: Kentucky

Source:

Project investment costs and projected energy and non-energy savings are developed in an Energy Engineering Analysis Program (EEAP) developed in 1994 by Systems Engineering and Management Corporation under contract with the U.S. Army Corps of Engineers, Mobile District. Projected energy savings are based on an energy usage survey conducted at Fort Knox and on actual FY94 energy costs to the installation. Investment costs are inflated to reflect FY95 construction costs.

**TABLE 4.1**  
**PROJECT SUMMARY:**  
**INFRA-RED HEAT - ECIP PROJECT 2**  
**(INCLUDING FEMP 3)**

ECO NUMBER	BUILDING NUMBER	BASELINE ENERGY (MBTU)	ECO ENERGY (MBTU)	ENERGY SAVINGS (MBTU)	1ST YEAR SAVINGS	INVESTMENT COST	NON-ENERGY ANNUAL RECURRING	TOTAL NON-ENERGY NON-RECURRING	SPB (YR)	SIR
1	2762 - 2767, 2778 & 2781	18,149	8,901	9,247	\$48,583	\$483,650	\$1,980	\$77,604	9.96	2.03
1	2770	29,139	14,292	14,847	\$73,478	\$271,299	\$1,980	\$58,088	3.69	5.57
1	2942 - 2944	8,544	4,190	4,353	\$44,565	\$226,146	\$2,970	\$91,335	5.07	3.12
1	FEMP PROJECT 3	55,831	27,383	28,448	\$166,626	\$981,094	\$6,930	\$227,026	5389.00	3.26
1	6113-6118, 6142-6147	14,811	7,265	7,547	\$77,721	\$503,778	\$3,960	\$191,341	6.48	2.44
1	6560-6564, 6576, 6577	6,569	3,222	3,347	\$36,858	\$263,339	\$2,970	\$108,338	7.14	2.22
1	6592	1,317	646	671	\$4,810	\$37,462	\$990	\$14,407	7.79	2.41
1	ECIP PROJECT 2 INCL FEMP 3 & 4 EXCPT. 5220 & 5253	78,529	38,516	40,013	\$286,015	\$1,785,673	\$14,850	\$541,112	6.24	2.86

**TABLE 4.1**  
**PROJECT SUMMARY:**  
**INFRA-RED HEAT - ECIP PROJECT 2**  
**(INCLUDING FEMP 3)**

ECO NUMBER	BUILDING NUMBER	BASELINE ENERGY (MJ)	ECO ENERGY (MJ)	ENERGY SAVINGS (MJ)	1ST YEAR SAVINGS	INVESTMENT COST	NON-ENERGY ANNUAL RECURRING	TOTAL NON-ENERGY NON-RECURRING	SPB (YR)	SIR
1	2762 - 2767, 2778 & 2781	19,146,995	9,390,966	9,756,028	\$48,583	\$483,650	\$1,980	\$77,604	9.96	2.03
1	2770	30,741,455	15,077,701	15,663,754	\$73,478	\$271,299	\$1,980	\$58,088	3.69	5.57
1	2942 - 2944	9,013,403	4,420,777	4,592,626	\$44,565	\$226,146	\$2,970	\$91,335	5.07	3.12
1	FEMP PROJECT 3	58,901,853	28,889,445	30,012,408	\$166,626	\$981,094	\$6,930	\$227,026	5389.00	3.26
1	6113-6118,6142-6147	15,626,111	7,664,111	7,962,001	\$77,721	\$503,778	\$3,960	\$191,341	6.48	2.44
1	6560-6564,6576,6577	6,930,612	3,399,242	3,531,370	\$36,858	\$263,339	\$2,970	\$108,338	7.14	2.22
1	6592	1,389,245	681,382	707,863	\$4,810	\$37,462	\$990	\$14,407	7.79	2.41
1	ECIP PROJECT 2 INCL FEMP 3 & 4 EXCPT. 5220 & 5253	82,847,821	40,634,180	42,213,641	\$286,015	\$1,785,673	\$14,850	\$541,112	6.24	2.86

LIFE CYCLE COST ANALYSIS SUMMARY

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)      STUDY: PRJT34  
 INSTALLATION & LOCATION: FORT KNOX      REGION NOS. 4      LCCID 1.080  
 PROJECT NO. & TITLE: PRJT34      ECIP PROJECT 2 - INFRARED HEAT  
 FISCAL YEAR 95      DISCRETE PORTION NAME: INFRARED  
 ANALYSIS DATE: 10-26-94      ECONOMIC LIFE 20 YEARS PREPARED BY: JAH

1. INVESTMENT

A. CONSTRUCTION COST	\$	1623339.	
B. SIOH	\$	81167.	
C. DESIGN COST	\$	81167.	
D. TOTAL COST (1A+1B+1C)	\$	1785673.	
E. SALVAGE VALUE OF EXISTING EQUIPMENT	\$	0.	
F. PUBLIC UTILITY COMPANY REBATE	\$	0.	
G. TOTAL INVESTMENT (1D - 1E - 1F)			\$ 1785673.

2. ENERGY SAVINGS (+) / COST (-)

DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTORS OCT 1993

FUEL	UNIT COST \$/MBTU (1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT	\$ .00	0.	\$ 0.	15.61	\$ 0.
B. DIST	\$ 6.60	29924.	\$ 197500.	17.56	\$ 3468106.
C. RESID	\$ .00	0.	\$ 0.	19.97	\$ 0.
D. NAT G	\$ 4.62	10089.	\$ 46610.	20.96	\$ 976935.
E. COAL	\$ .00	0.	\$ 0.	17.58	\$ 0.
F. LPG	\$ .00	0.	\$ 0.	16.12	\$ 0.
M. DEMAND SAVINGS			\$ 0.	14.74	\$ 0.
N. TOTAL		40013.	\$ 244110.		\$ 4445041.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)

(1) DISCOUNT FACTOR (TABLE A)	14.74	\$ 14850.
(2) DISCOUNTED SAVING/COST (3A X 3A1)		\$ 218889.

B. NON RECURRING SAVINGS(+) / COSTS(-)

ITEM	SAVINGS(+) / COST(-) (1)	YR OC (2)	DISCNT FACTOR (3)	DISCOUNTED SAVINGS(+) / COST(-) (4)
1. REPAIR	\$ 137057.	5	.86	117869.
2. REPAIR2	\$ 137057.	15	.63	86346.
3. REPAIR3	\$ 25148.	7	.81	20370.
4. REPAIR4	\$ 25148.	14	.65	16346.
5. ENVIR	\$ 216702.	3	.91	197199.
d. TOTAL	\$ 541112.			438129.

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) \$ 657019.

4. FIRST YEAR DOLLAR SAVINGS  $2N3+3A+(3Bd1/(YRS \text{ ECONOMIC LIFE}))$  \$ 286015.

5. SIMPLE PAYBACK PERIOD (1G/4) 6.24 YEARS

6. TOTAL NET DISCOUNTED SAVINGS (2N5+3C) \$ 5102060.

7. SAVINGS TO INVESTMENT RATIO (SIR) = (6 / 1G) = 2.86  
 (IF < 1 PROJECT DOES NOT QUALIFY)

8. ADJUSTED INTERNAL RATE OF RETURN (AIRR): 8.66 %

LIFE CYCLE COST ANALYSIS SUMMARY

STUDY: PRJT3  
LCCID 1.080

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

INSTALLATION & LOCATION: FORT KNOX      REGION NOS. 4 CENSUS: 3

PROJECT NO. & TITLE: PRJT3      FEMP PROJECT 3 - INFRARED HEAT

FISCAL YEAR 95      DISCRETE PORTION NAME: INFRARED

ANALYSIS DATE: 10-18-94      ECONOMIC LIFE 20 YEARS PREPARED BY: JAH

1. INVESTMENT

A. CONSTRUCTION COST	\$	891904.	
B. SIOH	\$	44595.	
C. DESIGN COST	\$	44595.	
D. TOTAL COST (1A+1B+1C)	\$	981094.	
E. SALVAGE VALUE OF EXISTING EQUIPMENT	\$	0.	
F. PUBLIC UTILITY COMPANY REBATE	\$	0.	
G. TOTAL INVESTMENT (1D - 1E - 1F)	\$		981094.

2. ENERGY SAVINGS (+) / COST (-)

DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTORS OCT 1993

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ .00	0.	\$ 0.	15.61	\$ 0.
B. DIST	\$ 6.60	8544.	\$ 56387.	17.56	\$ 990159.
C. RESID	\$ .00	0.	\$ 0.	19.97	\$ 0.
D. NAT G	\$ 4.62	19904.	\$ 91958.	20.96	\$ 1927434.
E. COAL	\$ .00	0.	\$ 0.	17.58	\$ 0.
F. LPG	\$ .00	0.	\$ 0.	16.12	\$ 0.
M. DEMAND SAVINGS			\$ 0.	14.74	\$ 0.
N. TOTAL		28448.	\$ 148345.		\$ 2917593.

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)

(1) DISCOUNT FACTOR (TABLE A)      14.74      \$ 6930.

(2) DISCOUNTED SAVING/COST (3A X 3A1)      \$ 102148.

B. NON RECURRING SAVINGS (+) / COSTS (-)

ITEM	SAVINGS (+) COST (-) (1)	YR OC (2)	DISCNT FACTR (3)	DISCOUNTED SAVINGS (+) / COST (-) (4)
1. REPAIR	\$ 66089.	5	.86	56837.
2. REPAIR2	\$ 66089.	15	.63	41636.
3. REPAIR3	\$ 15573.	7	.81	12614.
4. REPAIR4	\$ 15573.	14	.65	10122.
5. ENVIR	\$ 63703.	3	.91	57970.

d. TOTAL      \$ 227026.      179178.

C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) \$ 281327.

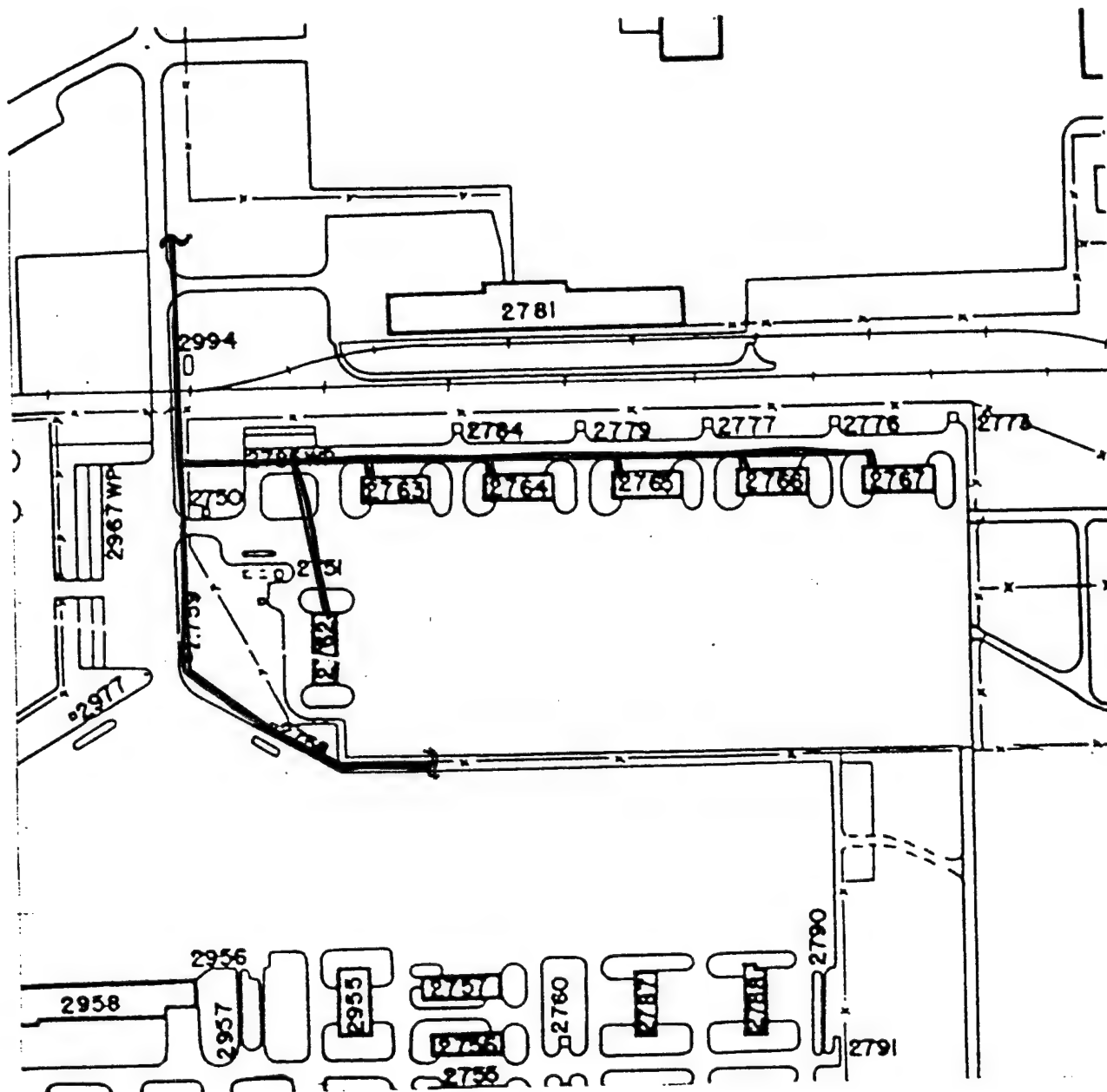
4. FIRST YEAR DOLLAR SAVINGS  $2N3+3A+(3Bd1/(YRS \text{ ECONOMIC LIFE}))$  \$ 166626.

5. SIMPLE PAYBACK PERIOD (1G/4)      5.89 YEARS

6. TOTAL NET DISCOUNTED SAVINGS (2N5+3C)      \$ 3198919.

7. SAVINGS TO INVESTMENT RATIO (SIR) = (6 / 1G) = 3.26  
(IF < 1 PROJECT DOES NOT QUALIFY)

8. ADJUSTED INTERNAL RATE OF RETURN (AIRR):      9.38 %



## HURLEY TANK MOTOR PARK

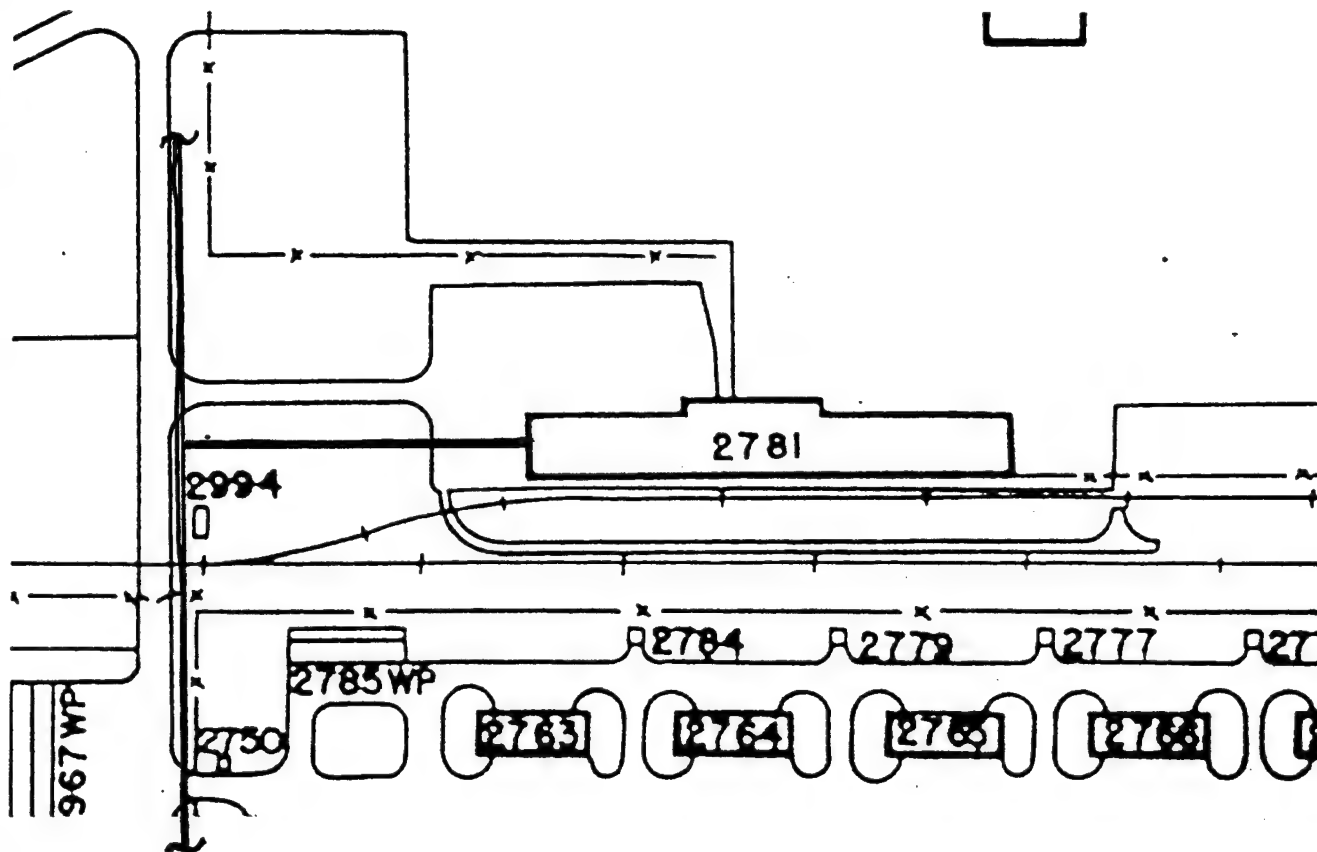
 EXISTING NG MAIN  
 PROPOSED NG MAIN

**SYSTEMS***corp*

SYSTEMS ENGINEERING AND MANAGEMENT CORPORATION  
KNOXVILLE, TENNESSEE 37919

**FT. KNOX GLASS STUDY,  
NEW NATURAL GAS LINES REQUIRED**

DRAWN BY	B. YATES	JOB NO.	94013.02	SHEET NO.
CHECKED BY	J. HOLLENSBE	DATE	10-07-94	



## BOATWRIGHT MAINTENANCE AREA - BLDG 2781

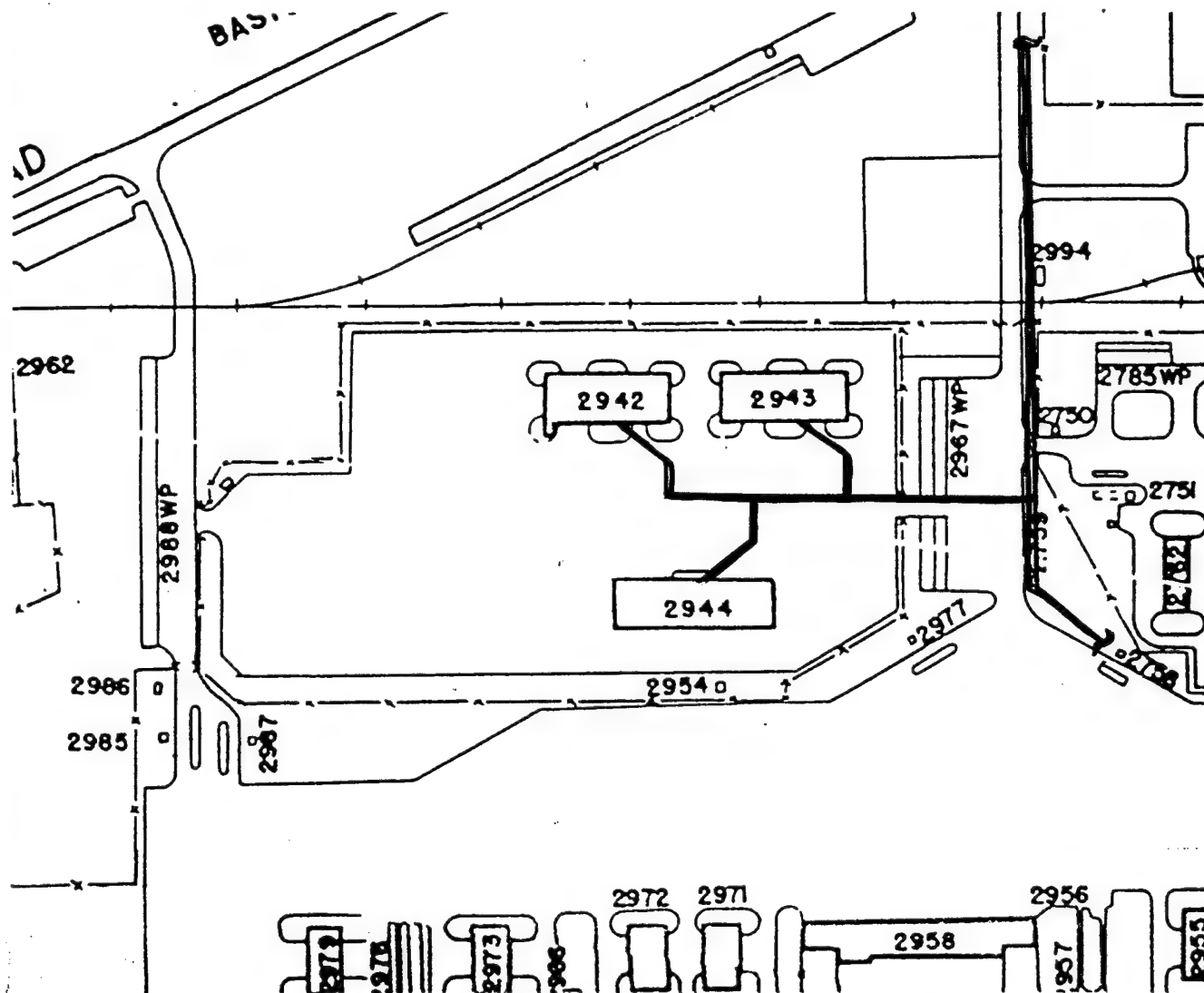
— EXISTING NG MAIN  
 - - - PROPOSED NG MAIN

**SYSTEMS***corp*

SYSTEMS ENGINEERING AND MANAGEMENT CORPORATION  
 KNOXVILLE, TENNESSEE 37919

**FT. KNOX GLASS STUDY**  
**NEW NATURAL GAS LINES REQUIRED**

DRAWN BY	B. YATES	JOB NO.	94013.02	SHEET NO.
CHECKED BY	J. HOLLENSBE	DATE	10-07-94	



## 194TH ARMORED BDE TACTICAL EQUIPMENT SHOPS

— EXISTING NG MAIN  
 - - - PROPOSED NG MAIN

**SYSTEMS***corp*

SYSTEMS ENGINEERING AND MANAGEMENT CORPORATION  
 KNOXVILLE, TENNESSEE 37919

**FT. KNOX GLASS STUDY  
 NEW NATURAL GAS LINES REQUIRED**

DRAWN BY	B. YATES	JOB NO.	94013.02	SHEET NO.
CHECKED BY	J. HOLLENSBE	DATE	10-07-94	

LIFE CYCLE COST ANALYSIS SUMMARY

STUDY: 2762ECO1

LCCID 1.080

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

INSTALLATION & LOCATION: FORT KNOX      REGION NOS. 4      CENSUS: 3

PROJECT NO. & TITLE: 2762ECO1      ECO-1 INFRARED HEAT

FISCAL YEAR 95      DISCRETE PORTION NAME: INFRARED

ANALYSIS DATE: 10-18-94      ECONOMIC LIFE 20 YEARS PREPARED BY: JAH

1. INVESTMENT

A. CONSTRUCTION COST	\$	439682.	
B. SIOH	\$	21984.	
C. DESIGN COST	\$	21984.	
D. TOTAL COST (1A+1B+1C)	\$	483650.	
E. SALVAGE VALUE OF EXISTING EQUIPMENT	\$	0.	
F. PUBLIC UTILITY COMPANY REBATE	\$	0.	
G. TOTAL INVESTMENT (1D - 1E - 1F)	\$		483650.

2. ENERGY SAVINGS (+) / COST (-)

DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTORS OCT 1993

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ .00	0.	\$ 0.	15.61	\$ 0.
B. DIST	\$ 6.60	0.	\$ 0.	17.56	\$ 0.
C. RESID	\$ .00	0.	\$ 0.	19.97	\$ 0.
D. NAT G	\$ 4.62	9247.	\$ 42723.	20.96	\$ 895476.
E. COAL	\$ .00	0.	\$ 0.	17.58	\$ 0.
F. LPG	\$ .00	0.	\$ 0.	16.12	\$ 0.
M. DEMAND SAVINGS			\$ 0.	14.74	\$ 0.
N. TOTAL		9247.	\$ 42723.		\$ 895476.

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)		\$	1980.
(1) DISCOUNT FACTOR (TABLE A)	14.74		
(2) DISCOUNTED SAVING/COST (3A X 3A1)		\$	29185.

B. NON RECURRING SAVINGS (+) / COSTS (-)

ITEM	SAVINGS (+) COST (-) (1)	YR OC (2)	DISCNT FACTOR (3)	DISCOUNTED SAVINGS (+) / COST (-) (4)
1. REPAIR	\$ 32379.	5	.86	27846.
2. REPAIR2	\$ 32379.	15	.63	20399.
3. REPAIR3	\$ 6423.	7	.81	5202.
4. REPAIR4	\$ 6423.	14	.65	4175.

d. TOTAL	\$	77604.	57622.
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C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4)	\$	86807.
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4. FIRST YEAR DOLLAR SAVINGS $2N3+3A+(3Bd1/(YRS \text{ ECONOMIC LIFE}))$	\$	48583.
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5. SIMPLE PAYBACK PERIOD (1G/4)	9.96 YEARS
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6. TOTAL NET DISCOUNTED SAVINGS (2N5+3C)	\$	982283.
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7. SAVINGS TO INVESTMENT RATIO (SIR) = (6 / 1G) =	2.03
(IF < 1 PROJECT DOES NOT QUALIFY)	

8. ADJUSTED INTERNAL RATE OF RETURN (AIRR):	6.82 %
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Estimate:      276X AREA          Date:      06-Aug-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   TRENCHING MAIN LINCity indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205542200	SITE DEMOLITION, PAVEMENT, CONCRETE, TO 24"THICK, REINFORCED					40.00 C.Y.	
Unit values		4.21	0.00	92.52	133.64	0.00	226.16
Totals		168.44	\$0	\$3,701	\$5,346	\$0	\$9,047
0222541900	TAMPING TRENCH B'FILL, VIBRATING PLATE, ADD					85.00 C.Y.	
Unit values		0.09	0.00	1.74	0.67	0.00	2.41
Totals		7.57	\$0	\$148	\$57	\$0	\$205
0222582800	TRENCH EXCVTNG 40HP CHNTRNCHR&BKFL 12"W24"D					1150.00 L.F.	
Unit values		0.01	0.00	0.24	0.24	0.00	0.47
Totals		11.50	\$0	\$272	\$272	\$0	\$544
0251200400	CONCRETE PAVING, JOINTS/FINISH, 4500 PSI CONCRETE, 12" THICK					60.00 S.Y.	
Unit values		0.05	17.52	1.07	1.02	0.00	19.61
Totals		2.94	\$1,051	\$64	\$61	\$0	\$1,176
0260120200	BEDDING, FOR PIPE IN TRENCH SAND, DEAD OR BANK					21.50 C.Y.	
Unit values		0.16	2.43	3.37	1.37	0.00	7.17
Totals		3.44	\$52	\$72	\$29	\$0	\$153
0260120500	BEDDING, PLACING IN TRENCH					21.50 C.Y.	
Unit values		0.09	0.00	1.74	0.67	0.00	2.41
Totals		1.91	\$0	\$37	\$14	\$0	\$51
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520200	GAS SERVICE & DISTRIB PIPING, POLYETHYLENE, 60- PSI 2" DIAM COIL SDR 11					1150.00 L.F.	
Unit values		0.07	0.75	1.48	0.00	0.00	2.23
Totals		77.05	\$866	\$1,702	\$0	\$0	\$2,568

17-Oct-94

MeansData for Lotus

Page 2

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Line #      Description
-----
            Manhours  Matl    Labor   Equipment   Sub    Total
=====
U02 SITEWORK      275    $2,229    $6,031    $5,785        $0    $14,045

1562600139      GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
                TYPE 2" PIPE SIZE
Unit values      0.73    420.00    16.42      0.00      0.00    436.42
Totals           0.73    $420      $16        $0        $0      $436

U15 MECHANICAL      1      $420      $16        $0        $0      $436
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Line #      Description
-----
              Manhours   Matl     Labor   Equipment   Sub     Total
=====
```

ESTIMATE TOTAL	276	\$2,649	\$6,047	\$5,785	\$0	\$14,481
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$2,649	\$6,047	\$5,785	\$0	\$14,481
CONTINGENCY	10.00%					\$1,448
BOND	0.00%					\$0
PROFIT	10.00%					\$1,448
JOB TOTAL						\$17,377

```

=====
Estimate:      276X AREA          Date:      06-Aug-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   TRENCHING MAIN LINCity indx:Louisville, KY
=====

```

## SUMMARY

```

-----
Manhours  Matl  Labor  Equipment  Sub  Total
=====
U02 SITEWORK      275    $2,229    $6,031    $5,785      $0    $14,045
U15 MECHANICAL      1      $420      $16        $0      $0      $436
TOTAL              276    $2,649    $6,047    $5,785      $0    $14,481

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC $2,649    $6,047    $5,785      $0    $14,481
CONTINGENCY        10.00%      $0
BOND               0.00%      $0
PROFIT            10.00%      $0
JOB TOTAL                                $17,377

```

```

=====
Estimate:      BLDG 2762          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP (GLASS Bid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   4800.00           City indx: Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205542200	SITE DEMOLITION, PAVEMENT, CONCRETE, TO 24" THICK, REINFORCED					8.50 C.Y.	
Unit values		4.21	0.00	92.52	133.64	0.00	226.16
Totals		35.79	\$0	\$786	\$1,136	\$0	\$1,922
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					400.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		60.00	\$0	\$1,262	\$514	\$0	\$1,776
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.50 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		7.27	\$0	\$190	\$0	\$0	\$190
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					200.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		14.20	\$0	\$395	\$47	\$0	\$442
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					100.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		20.00	\$0	\$555	\$68	\$0	\$623
0222541900	TAMPING TRENCH B'FILL, VIBRATING PLATE, ADD					16.00 C.Y.	
Unit values		0.09	0.00	1.74	0.67	0.00	2.41
Totals		1.42	\$0	\$28	\$11	\$0	\$39
0222582800	TRENCH EXCVTNG 40HP CHNTRNCHR&BKFL 12"W24"D					210.00 L.F.	
Unit values		0.01	0.00	0.24	0.24	0.00	0.47
Totals		2.10	\$0	\$50	\$50	\$0	\$100
0251200400	CONCRETE PAVING, JOINTS/FINISH, 4500 PSI CONCRETE, 12" THICK					31.50 S.Y.	
Unit values		0.05	17.52	1.07	1.02	0.00	19.61
Totals		1.54	\$552	\$34	\$32	\$0	\$618
0260120200	BEDDING, FOR PIPE IN TRENCH SAND, DEAD OR BANK					4.50 C.Y.	

Unit values	0.16	2.43	3.37	1.37	0.00	7.17
Totals	0.72	\$11	\$15	\$6	\$0	\$32
0260120500	BEDDING, PLACING IN TRENCH					
Unit values	0.09	0.00	1.74	0.67	4.50 C.Y.	
Totals	0.40	\$0	\$8	\$3	0.00	2.41
					\$0	\$11
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					
Unit values	1.56	259.60	35.47	5.91	1.00 Ea.	
Totals	1.56	\$260	\$35	\$6	0.00	300.98
					\$0	\$301
0268520200	GAS SERVICE & DISTRIB PIPING, POLYETHYLENE, 60- PSI 2" DIAM COIL SDR 11					
Unit values	0.07	0.75	1.48	0.00	240.00 L.F.	
Totals	16.08	\$181	\$355	\$0	0.00	2.23
					\$0	\$536
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1"DIAM					
Unit values	0.11	1.92	2.96	0.17	50.00 L.F.	
Totals	5.35	\$96	\$148	\$9	0.00	5.06
					\$0	\$253

```

=====
Line #      Description
-----
            Manhours  Matl    Labor  Equipment  Sub    Total
=====
U02 SITEWORK      167    $1,100    $3,861    $1,882        $0    $6,843
1554510245      HTG INFA-RD UNT GAS ELEC IGN  (See Atached for Breakdown)
                                     1.00 LS.
Unit values      0.00      0.00      0.00      0.00  17306.00  20500.00
Totals           0.00      $0        $0        $0    $20,500    $20,500
1562600137      GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
                TYPE 1-1/4" PIPE SIZE
Unit values      0.53    226.00    12.10      0.00      0.00    238.10
Totals           0.53    $226      $12        $0        $0    $238
U15 MECHANICAL      1      $226      $12        $0    $20,500    $20,738

```

```
=====
Line #      Description
-----
              Manhours   Matl     Labor   Equipment   Sub     Total
=====
```

ESTIMATE TOTAL	168	\$1,326	\$3,873	\$1,882	\$20,500	\$27,581
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$1,326	\$3,873	\$1,882	\$20,500	\$27,581
CONTINGENCY	20.00%					\$5,516
BOND	0.00%					\$0
PROFIT	10.00%					\$2,758
JOB TOTAL						\$35,855

```

=====
Estimate:      BLDG 2762          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY      Job #:      94013.02
Sq. footage:  4800.00          City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
              Manhours   Matl    Labor   Equipment   Sub    Total
=====
U02 SITEWORK      167    $1,100    $3,861    $1,882        $0    $6,843
U15 MECHANICAL      1      $226      $12        $0    $20,500    $20,738
TOTAL              168    $1,326    $3,873    $1,882    $20,500    $27,581

SALES TAX          0.00%        $0
MATL MARKUP        0.00%        $0
LABOR MARKUP       0.00%        $0
EQUIPT MARKUP     0.00%        $0
SUB MARKUP        0.00%        $0

TOTAL BEFORE CONTINGENC  $1,326    $3,873    $1,882    $20,500    $27,581
CONTINGENCY        20.00%                $5,516
BOND               0.00%                $0
PROFIT            10.00%                $2,758
JOB TOTAL                                $35,855
=====

```

```

=====
Estimate:      BLDG 2762          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					300.00 L.F.	
Unit values.		0.15	2.22	4.57	0.00	0.00	6.79
Totals		44.70	\$665	\$1,372	\$0	\$0	\$2,037
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					20.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		2.98	\$44	\$91	\$0	\$0	\$135
A09 ELECTRICAL		48	\$709	\$1,463	\$0	\$0	\$2,172

=====						
Line #	Description					
		Manhours	Matl	Labor	Equipment	Sub Total
=====						
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					275.00 L.F.
Unit values		0.44	4.17	10.30	0.00	0.00 14.47
Totals		122.10	\$1,147	\$2,833	\$0	\$0 \$3,980
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNDR SZD FOR CVRG 10' OC 1/2" DIAM					320.00 L.F.
Unit values		0.13	1.64	2.88	0.00	0.00 4.52
Totals		40.64	\$525	\$920	\$0	\$0 \$1,445
1519010320	ALUMINUM REFLECTORS W/HANGERS					38.00 Ea.
Unit values		0.50	39.79	3.80	0.00	0.00 43.59
Totals		19.00	\$1,512	\$145	\$0	\$0 \$1,657
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.
Unit values		3.00	738.35	120.15	0.00	0.00 858.50
Totals		3.00	\$738	\$120	\$0	\$0 \$858
1552301020	GAS FIRED BURNER 100 MBH & COMBUSTION CHAMBER					6.00 Ea.
Unit values		1.00	860.00	44.06	0.00	0.00 904.06
Totals		6.00	\$5,160	\$264	\$0	\$0 \$5,424
1554510160	CO RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 40MBH					1.00 Ea.
Unit values		4.00	935.00	81.70	0.00	0.00 1016.70
Totals		4.00	\$935	\$82	\$0	\$0 \$1,017
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					1.00 Ea.
Unit values		1.60	70.00	76.50	0.00	0.00 146.50
Totals		1.60	\$70	\$76	\$0	\$0 \$146
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					2.00 Ea.
Unit values		1.00	75.00	27.55	0.00	0.00 102.55
Totals		2.00	\$150	\$55	\$0	\$0 \$205
U15 MECHANICAL		199	\$10,237	\$4,495	\$0	\$0 \$14,732

```
=====
Line #      Description
-----
            Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

1631200100 HEATING SYSTEM POWER / CONTROL PANEL

Unit values	2.96	330.76	70.58	0.00	1.00 Ea.	
Totals	2.96	\$331	\$71	\$0	0.00	401.34
					\$0	\$402

U16 ELECTRICAL            3            \$331            \$71            \$0            \$0            \$402

```
=====
Line #      Description
-----
      Manhours   Matl    Labor   Equipment   Sub    Total
=====
```

ESTIMATE TOTAL	250	\$11,277	\$6,029	\$0	\$0	\$17,306
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$11,277	\$6,029	\$0	\$0	\$17,306
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$17,306

```

=====
Estimate:      BLDG 2762           Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
A09 ELECTRICAL      48      $709    $1,463        $0      $0    $2,172
U15 MECHANICAL     199    $10,237    $4,495        $0      $0   $14,732
U16 ELECTRICAL       3      $331      $71          $0      $0    $402
TOTAL              250    $11,277    $6,029        $0      $0   $17,306

SALES TAX           0.00%      $0
MATL MARKUP         0.00%      $0
LABOR MARKUP        0.00%      $0
EQUIPT MARKUP       0.00%      $0
SUB MARKUP          0.00%      $0

TOTAL BEFORE CONTINGENC $11,277    $6,029        $0      $0   $17,306
CONTINGENCY          0.00%
BOND                 0.00%
PROFIT               0.00%

JOB TOTAL                                     $17,306
=====

```

```

=====
Estimate:      BLDG 2763          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP (GLASS Bid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   4800.00           City indx: Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					400.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		60.00	\$0	\$1,262	\$514	\$0	\$1,776
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.50 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		7.27	\$0	\$190	\$0	\$0	\$190
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					200.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		14.20	\$0	\$395	\$47	\$0	\$442
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					100.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		20.00	\$0	\$555	\$68	\$0	\$623
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE & DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT & WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		109	\$356	\$2,585	\$644	\$0	\$3,585



```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	110	\$582	\$2,597	\$644	\$17,306	\$21,129
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$582	\$2,597	\$644	\$17,306	\$21,129
CONTINGENCY	10.00%					\$2,113
BOND	0.00%					\$0
PROFIT	10.00%					\$2,113
JOB TOTAL						\$25,355

```

=====
Estimate:      BLDG 2763           Date:      14-Oct-94
Description:   COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY       Job #:      94013.02
Sq. footage:  4800.00           City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
U02 SITEWORK      109    $356    $2,585    $644      $0    $3,585
U15 MECHANICAL     1    $226     $12      $0    $17,306  $17,544
TOTAL             110    $582    $2,597    $644    $17,306  $21,129

SALES TAX         0.00%      $0
MATL MARKUP       0.00%      $0
LABOR MARKUP      0.00%      $0
EQUIPT MARKUP     0.00%      $0
SUB MARKUP        0.00%      $0

TOTAL BEFORE CONTINGENC  $582    $2,597    $644    $17,306  $21,129
CONTINGENCY       10.00%      $2,113
BOND              0.00%      $0
PROFIT            10.00%      $2,113
JOB TOTAL                                     $25,355
=====

```

```

=====
Estimate:      BLDG 2763          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					300.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		44.70	\$665	\$1,372	\$0	\$0	\$2,037
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					20.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		2.98	\$44	\$91	\$0	\$0	\$135
A09 ELECTRICAL		48	\$709	\$1,463	\$0	\$0	\$2,172

=====						
Line #	Description					
	Manhours	Matl	Labor	Equipment	Sub	Total
=====						
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					
Unit values	0.44	4.17	10.30	0.00	275.00 L.F.	
Totals	122.10	\$1,147	\$2,833	\$0	0.00	14.47
					\$0	\$3,980
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNGR SZD FOR CVRG 10' OC 1/2" DIAM					
Unit values	0.13	1.64	2.88	0.00	320.00 L.F.	
Totals	40.64	\$525	\$920	\$0	0.00	4.52
					\$0	\$1,445
1519010320	ALUMINUM REFLECTORS W/HANGERS					
Unit values	0.50	39.79	3.80	0.00	38.00 Ea.	
Totals	19.00	\$1,512	\$145	\$0	0.00	43.59
					\$0	\$1,657
1524105040	VACUUM PUMP AND VENT PIPING					
Unit values	3.00	738.35	120.15	0.00	1.00 Ea.	
Totals	3.00	\$738	\$120	\$0	0.00	858.50
					\$0	\$858
1552301020	GAS FIRED BURNER 100 MBH & COMBUSTION CHAMBER					
Unit values	1.00	860.00	44.06	0.00	6.00 Ea.	
Totals	6.00	\$5,160	\$264	\$0	0.00	904.06
					\$0	\$5,424
1554510160	CO RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 40MBH					
Unit values	4.00	935.00	81.70	0.00	1.00 Ea.	
Totals	4.00	\$935	\$82	\$0	0.00	1016.70
					\$0	\$1,017
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					
Unit values	1.60	70.00	76.50	0.00	1.00 Ea.	
Totals	1.60	\$70	\$76	\$0	0.00	146.50
					\$0	\$146
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					
Unit values	1.00	75.00	27.55	0.00	2.00 Ea.	
Totals	2.00	\$150	\$55	\$0	0.00	102.55
					\$0	\$205
U15 MECHANICAL	199	\$10,237	\$4,495	\$0	\$0	\$14,732

=====						
Line #	Description					
-----						
	Manhours	Matl	Labor	Equipment	Sub	Total
=====						
1631200100	HEATING SYSTEM POWER / CONTROL PANEL					
Unit values	2.96	330.76	70.58	0.00	1.00 Ea.	
Totals	2.96	\$331	\$71	\$0	0.00	401.34
					\$0	\$402
U16 ELECTRICAL	3	\$331	\$71	\$0	\$0	\$402

```
=====
Line #      Description
-----
              Manhours   Matl      Labor   Equipment   Sub      Total
=====

ESTIMATE TOTAL      250    $11,277    $6,029         $0         $0    $17,306
SALES TAX            0.00%         $0
MATL MARKUP          0.00%         $0
LABOR MARKUP         0.00%         $0
EQUIPT MARKUP        0.00%         $0
SUB MARKUP           0.00%         $0

TOTAL BEFORE CONTINGENC $11,277    $6,029         $0         $0    $17,306
CONTINGENCY          0.00%
BOND                 0.00%
PROFIT               0.00%

JOB TOTAL                                     $17,306
=====
```

```

=====
Estimate:      BLDG 2763           Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

## SUMMARY

	Manhours	Matl	Labor	Equipment	Sub	Total
A09 ELECTRICAL	48	\$709	\$1,463	\$0	\$0	\$2,172
U15 MECHANICAL	199	\$10,237	\$4,495	\$0	\$0	\$14,732
U16 ELECTRICAL	3	\$331	\$71	\$0	\$0	\$402
TOTAL	250	\$11,277	\$6,029	\$0	\$0	\$17,306
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$11,277	\$6,029	\$0	\$0	\$17,306
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$17,306

```

=====
Estimate:      BLDG 2764          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    4800.00          City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					400.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		60.00	\$0	\$1,262	\$514	\$0	\$1,776
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.50 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		7.27	\$0	\$190	\$0	\$0	\$190
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					200.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		14.20	\$0	\$395	\$47	\$0	\$442
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					100.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		20.00	\$0	\$555	\$68	\$0	\$623
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		109	\$356	\$2,585	\$644	\$0	\$3,585

```

=====
Line #      Description
-----
            Manhours  Matl    Labor  Equipment  Sub    Total
=====

1554510245  HTG INFA-RD UNT GAS ELEC IGN  (See Attached for Breakdown)
Unit values          0.00      0.00      0.00      0.00      1.00 LS.
Totals              0.00      $0        $0        $0      $17,306  $17,306

1562600137  GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
TYPE 1-1/4" PIPE SIZE
Unit values      0.53      226.00      12.10      0.00      0.00 Ea.
Totals           0.53      $226        $12        $0        $0      238.10
                                   $238

U15 MECHANICAL      1      $226        $12        $0      $17,306  $17,544

```

```
=====
Line #      Description
-----
      Manhours   Matl    Labor   Equipment   Sub    Total
=====
```

ESTIMATE TOTAL	110	\$582	\$2,597	\$644	\$17,306	\$21,129
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$582	\$2,597	\$644	\$17,306	\$21,129
CONTINGENCY	10.00%					\$2,113
BOND	0.00%					\$0
PROFIT	10.00%					\$2,113
JOB TOTAL						\$25,355

```

=====
Estimate:      BLDG 2764          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:      LIMITED EEAP (GLASS Bid Date:
Location:     FORT KNOX, KY      Job #:      94013.02
Sq. footage:  4800.00           City indx: Louisville, KY
=====

```

## SUMMARY

```

=====
              Manhours   Matl      Labor   Equipment   Sub      Total
=====
U02 SITEWORK      109      $356    $2,585    $644        $0    $3,585
U15 MECHANICAL     1      $226     $12      $0    $17,306    $17,544
TOTAL              110      $582    $2,597    $644    $17,306    $21,129

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC $582    $2,597    $644    $17,306    $21,129
CONTINGENCY        10.00%      $2,113
BOND                0.00%      $0
PROFIT             10.00%      $2,113
JOB TOTAL                                $25,355
=====

```

```

=====
Estimate:      BLDG 2764          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					300.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		44.70	\$665	\$1,372	\$0	\$0	\$2,037
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					20.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		2.98	\$44	\$91	\$0	\$0	\$135
A09 ELECTRICAL		48	\$709	\$1,463	\$0	\$0	\$2,172

=====						
Line #	Description					
		Manhours	Matl	Labor	Equipment	Sub Total
=====						
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					275.00 L.F.
Unit values	0.44	4.17	10.30	0.00	0.00	14.47
Totals	122.10	\$1,147	\$2,833	\$0	\$0	\$3,980
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNDR SZD FOR CVRG 10' OC 1/2" DIAM					320.00 L.F.
Unit values	0.13	1.64	2.88	0.00	0.00	4.52
Totals	40.64	\$525	\$920	\$0	\$0	\$1,445
1519010320	ALUMINUM REFLECTORS W/HANGERS					38.00 Ea.
Unit values	0.50	39.79	3.80	0.00	0.00	43.59
Totals	19.00	\$1,512	\$145	\$0	\$0	\$1,657
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.
Unit values	3.00	738.35	120.15	0.00	0.00	858.50
Totals	3.00	\$738	\$120	\$0	\$0	\$858
1552301020	GAS FIRED BURNER 100 MBH & COMBUSTION CHAMBER					6.00 Ea.
Unit values	1.00	860.00	44.06	0.00	0.00	904.06
Totals	6.00	\$5,160	\$264	\$0	\$0	\$5,424
1554510160	CO RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 40MBH					1.00 Ea.
Unit values	4.00	935.00	81.70	0.00	0.00	1016.70
Totals	4.00	\$935	\$82	\$0	\$0	\$1,017
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					1.00 Ea.
Unit values	1.60	70.00	76.50	0.00	0.00	146.50
Totals	1.60	\$70	\$76	\$0	\$0	\$146
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					2.00 Ea.
Unit values	1.00	75.00	27.55	0.00	0.00	102.55
Totals	2.00	\$150	\$55	\$0	\$0	\$205
U15 MECHANICAL		199	\$10,237	\$4,495	\$0	\$0 \$14,732

```
=====
Line #      Description
-----
           Manhours  Matl    Labor  Equipment  Sub    Total
=====

1631200100  HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58    0.00    1.00 Ea.
Totals           2.96    $331      $71      $0      0.00    401.34
                                     $0      $402

U16 ELECTRICAL      3      $331      $71      $0      $0      $402
```

```
=====
Line #      Description
-----
           Manhours   Matl     Labor   Equipment   Sub     Total
=====
```

ESTIMATE TOTAL	250	\$11,277	\$6,029	\$0	\$0	\$17,306
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$11,277	\$6,029	\$0	\$0	\$17,306
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$17,306

```

=====
Estimate:      BLDG 2764          Date:      14-Oct-94
Description:   INFRARED HEATING SYSTEM COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY      Job #:      94013.02
Sq. footage:  City indx:Louisville, KY
=====

```

-----  
SUMMARY  
-----

	Manhours	Matl	Labor	Equipment	Sub	Total
A09 ELECTRICAL	48	\$709	\$1,463	\$0	\$0	\$2,172
U15 MECHANICAL	199	\$10,237	\$4,495	\$0	\$0	\$14,732
U16 ELECTRICAL	3	\$331	\$71	\$0	\$0	\$402
TOTAL	250	\$11,277	\$6,029	\$0	\$0	\$17,306
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$11,277	\$6,029	\$0	\$0	\$17,306
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$17,306

```

=====
Estimate: .   BLDG 2765           Date:      14-Oct-94
Description:  COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY       Job #:      94013.02
Sq. footage:  4800.00           City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					400.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		60.00	\$0	\$1,262	\$514	\$0	\$1,776
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.50 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		7.27	\$0	\$190	\$0	\$0	\$190
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					200.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		14.20	\$0	\$395	\$47	\$0	\$442
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					100.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		20.00	\$0	\$555	\$68	\$0	\$623
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		109	\$356	\$2,585	\$644	\$0	\$3,585

```

=====
Line #      Description
-----
            Manhours  Matl    Labor  Equipment  Sub    Total
=====

1554510245  HTG INFA-RD UNT GAS ELEC IGN  (See Attached for Breakdown)
                                     1.00 LS.
Unit values      0.00      0.00      0.00      0.00  17306.00  17306.00
Totals           0.00      $0      $0      $0    $17,306  $17,306

1562600137  GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
            TYPE 1-1/4" PIPE SIZE
Unit values      0.53    226.00    12.10      0.00      0.00    238.10
Totals           0.53    $226      $12      $0      $0      $238

U15 MECHANICAL      1      $226      $12      $0    $17,306  $17,544

```

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	110	\$582	\$2,597	\$644	\$17,306	\$21,129
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$582	\$2,597	\$644	\$17,306	\$21,129
CONTINGENCY	10.00%					\$2,113
BOND	0.00%					\$0
PROFIT	10.00%					\$2,113
JOB TOTAL						\$25,355

```

=====
Estimate:      BLDG 2765           Date:      14-Oct-94
Description:    COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   4800.00           City indx:Louisville, KY
=====

```

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SUMMARY

-----

	Manhours	Matl	Labor	Equipment	Sub	Total
U02 SITEWORK	109	\$356	\$2,585	\$644	\$0	\$3,585
U15 MECHANICAL	1	\$226	\$12	\$0	\$17,306	\$17,544
TOTAL	110	\$582	\$2,597	\$644	\$17,306	\$21,129
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$582	\$2,597	\$644	\$17,306	\$21,129
CONTINGENCY	10.00%					\$2,113
BOND	0.00%					\$0
PROFIT	10.00%					\$2,113
JOB TOTAL						\$25,355

```

=====
Estimate:      BLDG 2765           Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					300.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		44.70	\$665	\$1,372	\$0	\$0	\$2,037
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					20.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		2.98	\$44	\$91	\$0	\$0	\$135
A09 ELECTRICAL		48	\$709	\$1,463	\$0	\$0	\$2,172

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					275.00 L.F.	
Unit values		0.44	4.17	10.30	0.00	0.00	14.47
Totals		122.10	\$1,147	\$2,833	\$0	\$0	\$3,980
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNCR SZD FOR CVRG 10' OC 1/2" DIAM					320.00 L.F.	
Unit values		0.13	1.64	2.88	0.00	0.00	4.52
Totals		40.64	\$525	\$920	\$0	\$0	\$1,445
1519010320	ALUMINUM REFLECTORS W/HANGERS					38.00 Ea.	
Unit values		0.50	39.79	3.80	0.00	0.00	43.59
Totals		19.00	\$1,512	\$145	\$0	\$0	\$1,657
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.	
Unit values		3.00	738.35	120.15	0.00	0.00	858.50
Totals		3.00	\$738	\$120	\$0	\$0	\$858
1552301020	GAS FIRED BURNER 100 MBH & COMBUSTION CHAMBER					6.00 Ea.	
Unit values		1.00	860.00	44.06	0.00	0.00	904.06
Totals		6.00	\$5,160	\$264	\$0	\$0	\$5,424
1554510160	CO RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 40MBH					1.00 Ea.	
Unit values		4.00	935.00	81.70	0.00	0.00	1016.70
Totals		4.00	\$935	\$82	\$0	\$0	\$1,017
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					1.00 Ea.	
Unit values		1.60	70.00	76.50	0.00	0.00	146.50
Totals		1.60	\$70	\$76	\$0	\$0	\$146
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					2.00 Ea.	
Unit values		1.00	75.00	27.55	0.00	0.00	102.55
Totals		2.00	\$150	\$55	\$0	\$0	\$205
U15 MECHANICAL		199	\$10,237	\$4,495	\$0	\$0	\$14,732

```
=====
Line #      Description
-----
            Manhours  Matl    Labor  Equipment  Sub      Total
=====
```

1631200100      HEATING SYSTEM POWER / CONTROL PANEL

Unit values	2.96	330.76	70.58	0.00	1.00 Ea.	
Totals	2.96	\$331	\$71	\$0	0.00	401.34
					\$0	\$402

U16 ELECTRICAL	3	\$331	\$71	\$0	\$0	\$402
----------------	---	-------	------	-----	-----	-------

```
=====
Line #      Description
-----
      Manhours   Matl    Labor   Equipment   Sub    Total
=====
```

ESTIMATE TOTAL	250	\$11,277	\$6,029	\$0	\$0	\$17,306
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$11,277	\$6,029	\$0	\$0	\$17,306
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$17,306

```

=====
Estimate:      BLDG 2765          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

=====

SUMMARY

-----

	Manhours	Matl	Labor	Equipment	Sub	Total
A09 ELECTRICAL	48	\$709	\$1,463	\$0	\$0	\$2,172
U15 MECHANICAL	199	\$10,237	\$4,495	\$0	\$0	\$14,732
U16 ELECTRICAL	3	\$331	\$71	\$0	\$0	\$402
TOTAL	250	\$11,277	\$6,029	\$0	\$0	\$17,306
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$11,277	\$6,029	\$0	\$0	\$17,306
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$17,306

```

=====
Estimate:      BLDG 2766           Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP (GLASS Bid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:   4800.00           City indx: Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					400.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		60.00	\$0	\$1,262	\$514	\$0	\$1,776
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.50 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		7.27	\$0	\$190	\$0	\$0	\$190
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					200.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		14.20	\$0	\$395	\$47	\$0	\$442
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					100.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		20.00	\$0	\$555	\$68	\$0	\$623
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE & DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT & WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		109	\$356	\$2,585	\$644	\$0	\$3,585

```

=====
Line #      Description
-----
              Manhours   Matl      Labor   Equipment   Sub      Total
=====

1554510245   HTG INFA-RD UNT GAS ELEC IGN (See Attached for Breakdown)
              0.00      0.00      0.00      0.00      1.00 LS.
Unit values              0.00      0.00      0.00      0.00 17306.00 17306.00
Totals                0.00      $0      $0      $0 $17,306 $17,306

1562600137   GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
              TYPE 1-1/4" PIPE SIZE
Unit values              0.53     226.00     12.10      0.00      1.00 Ea.
Totals                0.53     $226      $12      $0      0.00 238.10
              $226      $12      $0      $0 $238

U15 MECHANICAL      1      $226      $12      $0 $17,306 $17,544

```

```
=====
Line #      Description
-----
      Manhours   Matl    Labor   Equipment   Sub    Total
=====
```

ESTIMATE TOTAL	110	\$582	\$2,597	\$644	\$17,306	\$21,129
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$582	\$2,597	\$644	\$17,306	\$21,129
CONTINGENCY	10.00%					\$2,113
BOND	0.00%					\$0
PROFIT	10.00%					\$2,113
JOB TOTAL						\$25,355

```

=====
Estimate:      BLDG 2766           Date:      14-Oct-94
Description:   COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY       Job #:      94013.02
Sq. footage:  4800.00           City indx:Louisville, KY
=====

```

## SUMMARY

```

-----
Manhours  Matl  Labor  Equipment  Sub  Total
=====
U02 SITEWORK      109      $356    $2,585      $644      $0    $3,585
U15 MECHANICAL      1      $226      $12      $0    $17,306    $17,544
TOTAL             110      $582    $2,597      $644    $17,306    $21,129

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC  $582    $2,597      $644    $17,306    $21,129
CONTINGENCY        10.00%      $0
BOND               0.00%      $0
PROFIT            10.00%      $2,113
JOB TOTAL                                     $25,355

```

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=====
Estimate:      BLDG 2766           Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					300.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		44.70	\$665	\$1,372	\$0	\$0	\$2,037
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					20.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		2.98	\$44	\$91	\$0	\$0	\$135
A09 ELECTRICAL		48	\$709	\$1,463	\$0	\$0	\$2,172

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS 275.00 L.F.						
Unit values	0.44	4.17	10.30	0.00	0.00		14.47
Totals	122.10	\$1,147	\$2,833	\$0	\$0		\$3,980
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNGR SZD FOR CVRG 10' OC 1/2" DIAM 320.00 L.F.						
Unit values	0.13	1.64	2.88	0.00	0.00		4.52
Totals	40.64	\$525	\$920	\$0	\$0		\$1,445
1519010320	ALUMINUM REFLECTORS W/HANGERS 38.00 Ea.						
Unit values	0.50	39.79	3.80	0.00	0.00		43.59
Totals	19.00	\$1,512	\$145	\$0	\$0		\$1,657
1524105040	VACUUM PUMP AND VENT PIPING 1.00 Ea.						
Unit values	3.00	738.35	120.15	0.00	0.00		858.50
Totals	3.00	\$738	\$120	\$0	\$0		\$858
1552301020	GAS FIRED BURNER 100 MBH & COMBUSTION CHAMBER 6.00 Ea.						
Unit values	1.00	860.00	44.06	0.00	0.00		904.06
Totals	6.00	\$5,160	\$264	\$0	\$0		\$5,424
1554510160	CO RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 40MBH 1.00 Ea.						
Unit values	4.00	935.00	81.70	0.00	0.00		1016.70
Totals	4.00	\$935	\$82	\$0	\$0		\$1,017
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE 1.00 Ea.						
Unit values	1.60	70.00	76.50	0.00	0.00		146.50
Totals	1.60	\$70	\$76	\$0	\$0		\$146
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING 2.00 Ea.						
Unit values	1.00	75.00	27.55	0.00	0.00		102.55
Totals	2.00	\$150	\$55	\$0	\$0		\$205
U15 MECHANICAL		199	\$10,237	\$4,495	\$0	\$0	\$14,732

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
1631200100  HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58    0.00    1.00 Ea.
Totals           2.96    $331      $71      $0      0.00    401.34
                                   $0      $402

U16 ELECTRICAL      3      $331      $71      $0      $0      $402
```

```
=====
Line #      Description
-----
      Manhours   Matl    Labor   Equipment   Sub    Total
=====
```

ESTIMATE TOTAL	250	\$11,277	\$6,029	\$0	\$0	\$17,306
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$11,277	\$6,029	\$0	\$0	\$17,306
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$17,306

```

=====
Estimate:      BLDG 2766      Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY   Job #:      94013.02
Sq. footage:   City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
A09 ELECTRICAL      48      $709      $1,463      $0      $0      $2,172
U15 MECHANICAL     199     $10,237     $4,495      $0      $0     $14,732
U16 ELECTRICAL       3      $331       $71        $0      $0      $402
TOTAL              250     $11,277     $6,029      $0      $0     $17,306

SALES TAX           0.00%      $0
MATL MARKUP         0.00%      $0
LABOR MARKUP        0.00%      $0
EQUIPT MARKUP       0.00%      $0
SUB MARKUP          0.00%      $0

TOTAL BEFORE CONTINGENC $11,277     $6,029      $0      $0     $17,306
CONTINGENCY          0.00%
BOND                 0.00%
PROFIT               0.00%

JOB TOTAL                                           $17,306
=====

```

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=====
Estimate:      BLDG 2767          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    4800.00          City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					400.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		60.00	\$0	\$1,262	\$514	\$0	\$1,776
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.50 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		7.27	\$0	\$190	\$0	\$0	\$190
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					200.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		14.20	\$0	\$395	\$47	\$0	\$442
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					100.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		20.00	\$0	\$555	\$68	\$0	\$623
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		109	\$356	\$2,585	\$644	\$0	\$3,585

```
=====
Line #      Description
-----
            Manhours  Matl    Labor   Equipment  Sub    Total
=====

1554510245   HTG INFA-RD UNT GAS ELEC IGN  (See Attached for Breakdown)
                                     1.00 LS.
Unit values      0.00      0.00      0.00      0.00  17306.00  17306.00
Totals           0.00      $0        $0        $0    $17,306  $17,306

1562600137   GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
            TYPE 1-1/4" PIPE SIZE
Unit values      0.53     226.00     12.10      0.00      0.00    238.10
Totals           0.53     $226      $12        $0        $0      $238

U15 MECHANICAL      1      $226      $12        $0    $17,306  $17,544
```

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=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment    Sub    Total
=====
```

ESTIMATE TOTAL	110	\$582	\$2,597	\$644	\$17,306	\$21,129
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$582	\$2,597	\$644	\$17,306	\$21,129
CONTINGENCY	10.00%					\$2,113
BOND	0.00%					\$0
PROFIT	10.00%					\$2,113
JOB TOTAL						\$25,355

```

=====
Estimate:      BLDG 2767          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:      LIMITED EEAP (GLASS Bid Date:
Location:     FORT KNOX, KY      Job #:      94013.02
Sq. footage:  4800.00          City indx: Louisville, KY
=====

```

## SUMMARY

```

=====
              Manhours   Matl     Labor   Equipment   Sub       Total
=====
U02 SITEWORK      109      $356    $2,585     $644        $0      $3,585
U15 MECHANICAL      1      $226     $12        $0      $17,306   $17,544
TOTAL              110      $582    $2,597     $644      $17,306   $21,129

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC $582    $2,597     $644      $17,306   $21,129
CONTINGENCY        10.00%      $2,113
BOND               0.00%      $0
PROFIT            10.00%      $2,113
JOB TOTAL                                     $25,355
=====

```

```

=====
Estimate:      BLDG 2767          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					300.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		44.70	\$665	\$1,372	\$0	\$0	\$2,037
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					20.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		2.98	\$44	\$91	\$0	\$0	\$135
A09 ELECTRICAL		48	\$709	\$1,463	\$0	\$0	\$2,172

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					275.00 L.F.	
Unit values		0.44	4.17	10.30	0.00	0.00	14.47
Totals		122.10	\$1,147	\$2,833	\$0	\$0	\$3,980
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNGR SZD FOR CVRG 10' OC 1/2" DIAM					320.00 L.F.	
Unit values		0.13	1.64	2.88	0.00	0.00	4.52
Totals		40.64	\$525	\$920	\$0	\$0	\$1,445
1519010320	ALUMINUM REFLECTORS W/HANGERS					38.00 Ea.	
Unit values		0.50	39.79	3.80	0.00	0.00	43.59
Totals		19.00	\$1,512	\$145	\$0	\$0	\$1,657
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.	
Unit values		3.00	738.35	120.15	0.00	0.00	858.50
Totals		3.00	\$738	\$120	\$0	\$0	\$858
1552301020	GAS FIRED BURNER 100 MBH & COMBUSTION CHAMBER					6.00 Ea.	
Unit values		1.00	860.00	44.06	0.00	0.00	904.06
Totals		6.00	\$5,160	\$264	\$0	\$0	\$5,424
1554510160	CO RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 40MBH					1.00 Ea.	
Unit values		4.00	935.00	81.70	0.00	0.00	1016.70
Totals		4.00	\$935	\$82	\$0	\$0	\$1,017
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					1.00 Ea.	
Unit values		1.60	70.00	76.50	0.00	0.00	146.50
Totals		1.60	\$70	\$76	\$0	\$0	\$146
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					2.00 Ea.	
Unit values		1.00	75.00	27.55	0.00	0.00	102.55
Totals		2.00	\$150	\$55	\$0	\$0	\$205
U15 MECHANICAL		199	\$10,237	\$4,495	\$0	\$0	\$14,732

```
=====
Line #      Description
-----
           Manhours  Matl    Labor  Equipment  Sub    Total
=====

1631200100  HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58     0.00    1.00 Ea.  401.34
Totals           2.96    $331      $71      $0      $0      $402

U16 ELECTRICAL      3      $331      $71      $0      $0      $402
```

```
=====
Line #      Description
-----
      Manhours   Matl    Labor   Equipment   Sub    Total
=====
```

ESTIMATE TOTAL	250	\$11,277	\$6,029	\$0	\$0	\$17,306
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$11,277	\$6,029	\$0	\$0	\$17,306
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$17,306

```

=====
Estimate:      BLDG 2767          Date:      14-Oct-94
Description:   INFRARED HEATING SYSTEM COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY      Job #:      94013.02
Sq. footage:  City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
A09 ELECTRICAL      48      $709      $1,463      $0      $0      $2,172
U15 MECHANICAL     199     $10,237     $4,495      $0      $0     $14,732
U16 ELECTRICAL       3       $331       $71        $0      $0       $402
TOTAL              250     $11,277     $6,029      $0      $0     $17,306

SALES TAX           0.00%      $0
MATL MARKUP         0.00%      $0
LABOR MARKUP        0.00%      $0
EQUIPT MARKUP       0.00%      $0
SUB MARKUP          0.00%      $0

TOTAL BEFORE CONTINGENC $11,277     $6,029      $0      $0     $17,306
CONTINGENCY          0.00%      $0
BOND                 0.00%      $0
PROFIT               0.00%      $0

JOB TOTAL                                           $17,306
=====

```

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=====
Estimate:      BLDG 2778           Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP (GLASS Bid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    *****          City indx: Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					900.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		135.00	\$0	\$2,840	\$1,157	\$0	\$3,997
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					5.00 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		72.73	\$0	\$1,902	\$0	\$0	\$1,902
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					900.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		63.90	\$0	\$1,776	\$213	\$0	\$1,989
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					150.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		30.00	\$0	\$833	\$102	\$0	\$935
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520600	GAS SERVICE & DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT & WRAP 2" DIAM					150.00 L.F.	
Unit values		0.11	2.19	3.18	0.19	0.00	5.55
Totals		17.10	\$328	\$476	\$28	\$0	\$832
U02 SITEWORK		321	\$588	\$7,862	\$1,506	\$0	\$9,956

=====						
Line #	Description					
	Manhours	Matl	Labor	Equipment	Sub	Total
=====						
1554510245	HTG INFA-RD UNT GAS ELEC IGN (See Attached for Breakdown					
					1.00 LS	
Unit values	0.00	0.00	0.00	0.00	134504.00	134504.00
Totals	0.00	\$0	\$0	\$0	\$134,504	\$134,504
1562600139	GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM					
	TYPE 2" PIPE SIZE					1.00 Ea.
Unit values	0.73	420.00	16.42	0.00	0.00	436.42
Totals	0.73	\$420	\$16	\$0	\$0	\$436
U15 MECHANICAL	1	\$420	\$16	\$0	\$134,504	\$134,940

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	322	\$1,008	\$7,878	\$1,506	\$134,504	\$144,896
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$1,008	\$7,878	\$1,506	\$134,504	\$144,896
CONTINGENCY	10.00%					\$14,490
BOND	0.00%					\$0
PROFIT	10.00%					\$14,490
JOB TOTAL						\$173,875

```

=====
Estimate:      BLDG 2778           Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    *****          City indx:Louisville, KY
=====

```

## SUMMARY

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=====
              Manhours   Matl    Labor   Equipment   Sub       Total
=====
U02 SITEWORK      321      $588    $7,862    $1,506      $0      $9,956
U15 MECHANICAL     1      $420     $16      $0      $134,504  $134,940
TOTAL             322     $1,008    $7,878    $1,506    $134,504  $144,896

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC $1,008    $7,878    $1,506    $134,504  $144,896
CONTINGENCY        10.00%      $14,490
BOND               0.00%      $0
PROFIT            10.00%      $14,490

JOB TOTAL                                     $173,875
=====

```

```
=====
Estimate:      BLDG 2778          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP (GLASS Bid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    City indx: Louisville, KY
=====
```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					2520.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		375.48	\$5,583	\$11,523	\$0	\$0	\$17,106
A09 ELECTRICAL		376	\$5,583	\$11,523	\$0	\$0	\$17,106

=====						
Line #	Description					
	Manhours	Matl	Labor	Equipment	Sub	Total
=====						
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					
					2520.00 L.F.	
Unit values	0.44	4.17	10.30	0.00	0.00	14.47
Totals	1118.88	\$10,508	\$25,962	\$0	\$0	\$36,470
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNGR SZD FOR CVRG 10' OC 1/2" DIAM					
					2500.00 L.F.	
Unit values	0.13	1.64	2.88	0.00	0.00	4.52
Totals	317.50	\$4,100	\$7,189	\$0	\$0	\$11,289
1519010320	ALUMINUM REFLECTORS W/HANGERS					
					352.00 Ea.	
Unit values	0.50	39.79	3.80	0.00	0.00	43.59
Totals	176.00	\$14,006	\$1,339	\$0	\$0	\$15,345
1524105040	VACUUM PUMP AND VENT PIPING					
					8.00 Ea.	
Unit values	3.00	738.35	120.15	0.00	0.00	858.50
Totals	24.00	\$5,907	\$961	\$0	\$0	\$6,868
1552301020	CRV-100 GAS FIRED BURNER 100 MBH & COMBUSTION CHAMBER					
					48.00 Ea.	
Unit values	1.00	860.00	44.06	0.00	0.00	904.06
Totals	48.00	\$41,280	\$2,115	\$0	\$0	\$43,395
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					
					8.00 Ea.	
Unit values	1.00	75.00	27.55	0.00	0.00	102.55
Totals	8.00	\$600	\$220	\$0	\$0	\$820
U15 MECHANICAL	1693	\$76,401	\$37,786	\$0	\$0	\$114,187

```
=====
Line #      Description
-----
              Manhours   Matl      Labor   Equipment   Sub      Total
=====
1631200100  HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96      330.76      70.58      0.00      8.00 Ea.  401.34
Totals           23.70     $2,646      $565      $0        $0        $3,211

U16 ELECTRICAL      24      $2,646      $565      $0        $0        $3,211
```

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	2093	\$84,630	\$49,874	\$0	\$0	\$134,504
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$84,630	\$49,874	\$0	\$0	\$134,504
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$134,504

```

=====
Estimate:      BLDG 2778           Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:       LIMITED EEAP (GLASS Bid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   City indx: Louisville, KY
=====

```

## SUMMARY

	Manhours	Matl	Labor	Equipment	Sub	Total
A09 ELECTRICAL	376	\$5,583	\$11,523	\$0	\$0	\$17,106
U15 MECHANICAL	1693	\$76,401	\$37,786	\$0	\$0	\$114,187
U16 ELECTRICAL	24	\$2,646	\$565	\$0	\$0	\$3,211
TOTAL	2093	\$84,630	\$49,874	\$0	\$0	\$134,504
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$84,630	\$49,874	\$0	\$0	\$134,504
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$134,504

```

=====
Estimate:      BLDG 2780          Date:      06-Aug-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    Boatwright Blr PlaCity indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					150.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		22.50	\$0	\$473	\$193	\$0	\$666
0207180380	HVAC DEMO, BOILER GAS/OIL STL >150MBH					2.00 Ea.	
Unit values		12.00	0.00	323.82	0.00	0.00	323.82
Totals		24.00	\$0	\$648	\$0	\$0	\$648
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					5.00 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		72.73	\$0	\$1,902	\$0	\$0	\$1,902
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					150.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		10.65	\$0	\$296	\$35	\$0	\$331
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					100.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		20.00	\$0	\$555	\$68	\$0	\$623
U02 SITEWORK		150	\$0	\$3,874	\$296	\$0	\$4,170

```
=====
Line #      Description
-----
           Manhours   Matl     Labor   Equipment   Sub     Total
=====
```

ESTIMATE TOTAL	150	\$0	\$3,874	\$296	\$0	\$4,170
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$0	\$3,874	\$296	\$0	\$4,170
CONTINGENCY	10.00%					\$417
BOND	0.00%					\$0
PROFIT	10.00%					\$417
JOB TOTAL						\$5,004

```

=====
Estimate:      BLDG 2780           Date:      06-Aug-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    Boatwright Blr PlaCity indx:Louisville, KY
=====

```

-----  
SUMMARY  
-----

	Manhours	Matl	Labor	Equipment	Sub	Total
U02 SITEWORK	150	\$0	\$3,874	\$296	\$0	\$4,170
TOTAL	150	\$0	\$3,874	\$296	\$0	\$4,170
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$0	\$3,874	\$296	\$0	\$4,170
CONTINGENCY	10.00%					\$417
BOND	0.00%					\$0
PROFIT	10.00%					\$417
JOB TOTAL						\$5,004

```

=====
Estimate:      BLDG 2781          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY      Job #:      94013.02
Sq. footage:  *****          City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205541750	PAVEMENT REMOVAL, BITUMINOUS, 4" TO 6" THICK					28.00 S.Y.	
Unit values		0.10	0.00	2.09	3.02	0.00	5.11
Totals		2.66	\$0	\$58	\$85	\$0	\$143
0205542200	SITE DEMOLITION, PAVEMENT, CONCRETE, TO 24" THICK, REINFORCED					22.00 C.Y.	
Unit values		4.21	0.00	92.52	133.64	0.00	226.16
Totals		92.64	\$0	\$2,035	\$2,940	\$0	\$4,975
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					1000.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		150.00	\$0	\$3,156	\$1,285	\$0	\$4,441
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					1.00 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		14.55	\$0	\$380	\$0	\$0	\$380
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					1000.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		71.00	\$0	\$1,974	\$236	\$0	\$2,210
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					150.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		30.00	\$0	\$833	\$102	\$0	\$935
0222541900	TAMPING TRENCH B'FILL, VIBRATING PLATE, ADD					26.00 C.Y.	
Unit values		0.09	0.00	1.74	0.67	0.00	2.41
Totals		2.31	\$0	\$45	\$17	\$0	\$62
0222582800	TRENCH EXCVTNG 40HP CHNTRNCHR&BKFL 12"W24"D					350.00 L.F.	
Unit values		0.01	0.00	0.24	0.24	0.00	0.47
Totals		3.50	\$0	\$83	\$83	\$0	\$166
0251040380	ASPHALTIC CONCRETE PAVEMENT, PAVING, WEARING						

	COURSE, 2" THICK				28.00 S.Y.	
Unit values	0.02	1.90	0.33	0.30	0.00	2.53
Totals	0.42	\$53	\$9	\$8	\$0	\$70
0251200400	CONCRETE PAVING, JOINTS/FINISH, 4500 PSI					
	CONCRETE, 12" THICK					22.00 S.Y.
Unit values	0.05	17.52	1.07	1.02	0.00	19.61
Totals	1.08	\$386	\$24	\$22	\$0	\$432
0260120200	BEDDING, FOR PIPE IN TRENCH SAND, DEAD OR BANK					7.00 C.Y.
Unit values	0.16	2.43	3.37	1.37	0.00	7.17
Totals	1.12	\$17	\$24	\$10	\$0	\$51
0260120500	BEDDING, PLACING IN TRENCH					7.00 C.Y.
Unit values	0.09	0.00	1.74	0.67	0.00	2.41
Totals	0.62	\$0	\$12	\$5	\$0	\$17
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.
Unit values	1.56	259.60	35.47	5.91	0.00	300.98
Totals	1.56	\$260	\$35	\$6	\$0	\$301
0268520200	GAS SERVICE & DISTRIB PIPING, POLYETHYLENE, 60-PSI 2" DIAM COIL SDR 11					375.00 L.F.
Unit values	0.07	0.75	1.48	0.00	0.00	2.23
Totals	25.13	\$282	\$555	\$0	\$0	\$837
0268520600	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 2"DIAM					50.00 L.F.
Unit values	0.11	2.19	3.18	0.19	0.00	5.55
Totals	5.70	\$109	\$159	\$9	\$0	\$277

```

=====
Line #      Description
-----
            Manhours  Matl    Labor  Equipment  Sub    Total
=====
U02 SITEWORK      403    $1,107    $9,382    $4,808        $0    $15,297

1554510245      HTG INFA-RD UNT GAS ELEC IGN  (See Attached for Breakdown
                                     1.00 LS
Unit values      0.00      0.00      0.00      0.00    51359.00    51359.00
Totals           0.00      $0        $0        $0      $51,359    $51,359

1562600137      GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
TYPE 1-1/4" PIPE SIZE
Unit values      0.53     226.00     12.10      0.00      1.00 Ea.
Totals           0.53     $226      $12        $0        $0      238.10
                                     $238

1562600139      GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
TYPE 2" PIPE SIZE
Unit values      0.73     420.00     16.42      0.00      1.00 Ea.
Totals           0.73     $420      $16        $0      0.00      436.42
                                     $436

U15 MECHANICAL      2      $646      $28        $0    $51,359    $52,033

```

```
=====
Line #      Description
-----
              Manhours   Matl      Labor   Equipment   Sub      Total
=====
```

ESTIMATE TOTAL	405	\$1,753	\$9,410	\$4,808	\$51,359	\$67,330
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$1,753	\$9,410	\$4,808	\$51,359	\$67,330
CONTINGENCY	10.00%					\$6,733
BOND	0.00%					\$0
PROFIT	10.00%					\$6,733
JOB TOTAL						\$80,796

```

=====
Estimate:      BLDG 2781          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY      Job #:      94013.02
Sq. footage:  *****          City indx:Louisville, KY
=====

```

## SUMMARY

```

-----
Manhours  Matl  Labor  Equipment  Sub  Total
=====
U02 SITEWORK      403   $1,107   $9,382   $4,808   $0   $15,297
U15 MECHANICAL    2     $646    $28      $0       $51,359 $52,033
TOTAL             405   $1,753   $9,410   $4,808   $51,359 $67,330

SALES TAX         0.00%    $0
MATL MARKUP       0.00%    $0
LABOR MARKUP      0.00%    $0
EQUIPT MARKUP     0.00%    $0
SUB MARKUP        0.00%    $0

TOTAL BEFORE CONTINGENC $1,753   $9,410   $4,808   $51,359 $67,330
CONTINGENCY       10.00%    $6,733
BOND              0.00%    $0
PROFIT            10.00%    $6,733
JOB TOTAL                                     $80,796

```

```

=====
Estimate:      BLDG 2781          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					910.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		135.59	\$2,016	\$4,161	\$0	\$0	\$6,177
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					20.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		2.98	\$44	\$91	\$0	\$0	\$135
A09 ELECTRICAL		139	\$2,060	\$4,252	\$0	\$0	\$6,312

=====						
Line #	Description					
	Manhours	Matl	Labor	Equipment	Sub	Total
=====						
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					
Unit values	0.44	4.17	10.30	0.00	910.00 L.F.	
Totals	404.04	\$3,795	\$9,375	\$0	0.00	14.47
					\$0	\$13,170
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNGR SZD FOR CVRG 10' OC 1/2" DIAM					
Unit values	0.13	1.64	2.88	0.00	930.00 L.F.	
Totals	118.11	\$1,525	\$2,674	\$0	0.00	4.52
					\$0	\$4,199
1519010320	ALUMINUM REFLECTORS W/HANGERS					
Unit values	0.50	39.79	3.80	0.00	132.00 Ea.	
Totals	66.00	\$5,252	\$502	\$0	0.00	43.59
					\$0	\$5,754
1524105040	VACUUM PUMP AND VENT PIPING					
Unit values	3.00	738.35	120.15	0.00	3.00 Ea.	
Totals	9.00	\$2,215	\$360	\$0	0.00	858.50
					\$0	\$2,575
1552301020	GAS FIRED BURNER 100 MBH & COMBUSTION CHAMBER					
Unit values	1.00	860.00	44.06	0.00	18.00 Ea.	
Totals	18.00	\$15,480	\$793	\$0	0.00	904.06
					\$0	\$16,273
1554510160	CO RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 40MBH					
Unit values	4.00	935.00	81.70	0.00	1.00 Ea.	
Totals	4.00	\$935	\$82	\$0	0.00	1016.70
					\$0	\$1,017
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					
Unit values	1.60	70.00	76.50	0.00	1.00 Ea.	
Totals	1.60	\$70	\$76	\$0	0.00	146.50
					\$0	\$146
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					
Unit values	1.00	75.00	27.55	0.00	3.00 Ea.	
Totals	3.00	\$225	\$83	\$0	0.00	102.55
					\$0	\$308
U15 MECHANICAL	624	\$29,497	\$13,945	\$0	\$0	\$43,442

```
=====
Line #      Description
-----
              Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

1631200100      HEATING SYSTEM POWER / CONTROL PANEL

Unit values	2.96	330.76	70.58	0.00	4.00 Ea. 0.00	401.34
Totals	11.85	\$1,323	\$282	\$0	\$0	\$1,605

U16 ELECTRICAL      12      \$1,323      \$282      \$0      \$0      \$1,605

```
=====
Line #      Description
-----
           Manhours   Matl      Labor    Equipment   Sub      Total
=====

ESTIMATE TOTAL      775    $32,880    $18,479          $0          $0    $51,359

SALES TAX            0.00%          $0
MATL MARKUP          0.00%          $0
LABOR MARKUP         0.00%          $0
EQUIPT MARKUP        0.00%          $0
SUB MARKUP           0.00%          $0

TOTAL BEFORE CONTINGENC $32,880    $18,479          $0          $0    $51,359
CONTINGENCY           0.00%          $0
BOND                  0.00%          $0
PROFIT                0.00%          $0

JOB TOTAL                                $51,359
=====
```

```

=====
Estimate:      BLDG 2781          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
              Manhours   Matl     Labor   Equipment   Sub     Total
=====
A09 ELECTRICAL      139      $2,060    $4,252         $0         $0    $6,312
U15 MECHANICAL      624     $29,497   $13,945         $0         $0   $43,442
U16 ELECTRICAL       12      $1,323     $282         $0         $0    $1,605
TOTAL                775     $32,880   $18,479         $0         $0   $51,359

SALES TAX           0.00%         $0
MATL MARKUP         0.00%         $0
LABOR MARKUP        0.00%         $0
EQUIPT MARKUP       0.00%         $0
SUB MARKUP          0.00%         $0

TOTAL BEFORE CONTINGENC $32,880   $18,479         $0         $0   $51,359
CONTINGENCY         0.00%
BOND                0.00%
PROFIT              0.00%

JOB TOTAL                                           $51,359
=====

```

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 1 OF 3

BUILDING NUMBER: 2762 BUILDING HEATING TEMPERATURE SETPOINT: 60 F  
 OUTSIDE DESIGN TEMPERATURE 1 F  
 TEMPERATURE DIFFERENCE 59 F

INFILTRATION LOSSES = 1 AIR CHGS X 76800 VOL (CU FT) X 59 F TEMP DIFF X 0.019 = 0.09 MBTU / HR  
 FLOOR LOSSES = 320 LINEAR FEET OF PERIMETER X 59 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	4800	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.03	MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2334	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
CORR MTL PNL WALL =		AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
CLR SGL PANE WINDOWS =	624	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
METAL ROLL UP DOORS =	2112	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.07	MBTU / HR
MTL OVERHEAD DOORS =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
WOOD GLAZED O'HEAD DR =		AREA (SF) X	0.583	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG WOOD SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR =	50	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL =		AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

TOTAL BASELINE HEAT LOSSES = 0.30 MBTU / HR  
 = 318.18 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 2762 BUILDING HEATING TEMPERATURE SETPOINT: 55 F  
 OUTSIDE DESIGN TEMPERATURE 1 F  
 TEMPERATURE DIFFERENCE 54 F

INFILTRATION LOSSES = 1 AIR CHGS X 76800 VOL (CU FT) X 54 F TEMP DIFF X 0.019 = 0.08 MBTU / HR  
 FLOOR LOSSES = 320 LINEAR FEET OF PERIMETER X 54 F TEMP DIFF X 0.81 = 0.01 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	4800	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.03	MBTU / HR
FACE BRICK/BLK WALL =	0	AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2334	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
CORR MTL PNL WALL =	0	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
CLR SGL PANE WINDOWS =	624	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
METAL ROLL UP DOORS =	2112	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
MTL OVERHEAD DOORS =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
WOOD GLAZED O'HEAD DR =	0	AREA (SF) X	0.583	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG WOOD SLIDING DOOR =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR =	50	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/GLAZED PERSONNEL =	0	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL ECO HEAT LOSSES

= 0.28 MBTU / HR  
 = 291.21 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

		BUILDING NUMBER	2762	PAGE 3 OF 3	
		BASELINE	ECO - 1		
SYSTEM EFFICIENCY		60%	90%		
OUTSIDE DESIGN TEMP (F)		1	1		
HTG TEMP SETPOINT (F)		60	55		
HEATING DEGREE DAYS		4616	3396		
TOTAL HEAT LOSSES					
(MBTU / HR)		0.30	0.28		
\$ /MBTU -FUEL OIL		\$6.60	\$6.60		
\$ /MBTU -NATURAL GAS		\$4.62	\$4.62		
\$ /MBTU -PPG		\$10.84	\$10.84		

GLOSSARY OF TERMS	
1 MBTU = 1055 MJ	
0.019=CONSTANT	
.81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE	
CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS	
65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2	

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.30	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	943.82	MBTU/YR			
	0.6	SYS EFF	X	59	TEMP DIFFERENCE									
ECO - 1 =	943.82	MBTU/YR	X		CORR FACTOR	1				=	943.82	MBTU/YR		
	0.28	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY						
	0.9	SYS EFF	X	54	TEMP DIFFERENCE				=	462.91	MBTU/YR			
	462.91	MBTU/YR	X		CORR FACTOR	1								
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS												=	480.91	MBTU/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	943.82	MBTU / YR	X	4.62	\$ /MBTU	=	4,360.46	\$ /YR
ECO - 1 =	462.91	MBTU / YR	X	4.62	\$ /MBTU	=	2,138.66	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS								=
								2,221.79 \$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 2763		BUILDING HEATING TEMPERATURE SETPOINT: 60 F		PAGE 1 OF 3	
		OUTSIDE DESIGN TEMPERATURE		1 F	
		TEMPERATURE DIFFERENCE		59 F	
INFILTRATION LOSSES =		1	AIR CHGS X	76800	VOL (CU FT) X 59 F TEMP DIFF X 0.019 = 0.09 MBTU / HR
FLOOR LOSSES =		320	LINEAR FEET OF PERIMETER X	59 F TEMP DIFF X 0.81 = 0.02 MBTU / HR	
SURFACE HEAT LOSSES					
FLAT BUILT UP ROOF =	4800	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE = 0.03 MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
8" CINDER BLOCK WALL =	2334	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR
CORR MTL PNL WALL =		AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
CLR SGL PANE WINDOWS =	624	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR
METAL ROLL UP DOORS =	2112	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE = 0.07 MBTU / HR
MTL OVERHEAD DOORS =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
WOOD GLAZED O'HEAD DR =		AREA (SF) X	0.583	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
LG WOOD SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL PERSONNEL DR=	50	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
MTL/ GLAZED PERSONNEL=		AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
TOTAL BASELINE HEAT LOSSES				=	0.30 MBTU / HR
				=	318.18 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 2763		BUILDING HEATING TEMPERATURE SETPOINT: 55 F				PAGE 2 OF 3	
		OUTSIDE DESIGN TEMPERATURE 1 F					
		TEMPERATURE DIFFERENCE 54 F					
INFILTRATION LOSSES =	1	AIR CHGS	X	76800	VOL (CU FT)	X	54 F TEMP DIFF X 0.019 = 0.08 MBTU / HR
FLOOR LOSSES =	320	LINEAR FEET OF PERIMETER	X	54 F TEMP DIFF	X	0.81	= 0.01 MBTU / HR
SURFACE HEAT LOSSES							
FLAT BUILT UP ROOF =	4800	AREA (SF)	X	0.105	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.03 MBTU / HR
FACE BRICK/BLK WALL =	0	AREA (SF)	X	0.176	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
8" CINDER BLOCK WALL =	2334	AREA (SF)	X	0.389	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR
CORR MTL PNL WALL =	0	AREA (SF)	X	0.17	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
CLR SGL PANE WINDOWS =	624	AREA (SF)	X	1.235	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.04 MBTU / HR
METAL ROLL UP DOORS =	2112	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.06 MBTU / HR
MTL OVERHEAD DOORS =	0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
WOOD GLAZED O'HEAD DR =	0	AREA (SF)	X	0.583	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
LG WOOD SLIDING DOOR =	0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL PERSONNEL DR=	50	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
MTL/ GLAZED PERSONNEL=	0	AREA (SF)	X	0.615	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
TOTAL ECO HEAT LOSSES						= 0.28 MBTU / HR	
						= 291.21 MJ/HR	

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	BASELINE	ECO - 1
SYSTEM EFFICIENCY	60%	90%
OUTSIDE DESIGN TEMP (F)	1	1
HTG TEMP SETPOINT (F)	60	55
HEATING DEGREE DAYS	4616	3396
TOTAL HEAT LOSSES (MBTU / HR)	0.30	0.28
\$ /MBTU -FUEL OIL	\$6.60	\$6.60
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62
\$ /MBTU -PPG	\$10.84	\$10.84

BUILDING NUMBER 2763

### GLOSSARY OF TERMS

1 MBTU = 1055 MJ  
 0.019=CONSTANT  
 .81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE  
 CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS  
 65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.30	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	943.82	MBTU/YR
	0.6	SYS EFF	X	59	TEMP DIFFERENCE						
	943.82	MBTU/YR		X	CORR FACTOR		1		=	943.82	MBTU/YR
ECO - 1 =	0.28	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	462.91	MBTU/YR
	0.9	SYS EFF	X	54	TEMP DIFFERENCE						
	462.91	MBTU/YR		X	CORR FACTOR		1		=	462.91	MBTU/YR
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS	=								=	480.91	MBTU/YR
										507,357.33	MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	943.82	MBTU / YR	X	4.62	\$ /MBTU	=	4,360.46	\$ /YR
ECO - 1 =	462.91	MBTU / YR	X	4.62	\$ /MBTU	=	2,138.66	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS	=					=	2,221.79	\$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 2764		BUILDING HEATING TEMPERATURE SETPOINT: 60 F		PAGE 1 OF 3	
		OUTSIDE DESIGN TEMPERATURE		1 F	
		TEMPERATURE DIFFERENCE		59 F	
INFILTRATION LOSSES =	1	AIR CHGS X	76800	VOL (CU FT) X	59 F TEMP DIFF X 0.019 = 0.09 MBTU / HR
FLOOR LOSSES =	320	LINEAR FEET OF PERIMETER X	59	F TEMP DIFF X	0.81 = 0.02 MBTU / HR
<b>SURFACE HEAT LOSSES</b>					
FLAT BUILT UP ROOF =	4800	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.03 MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
8" CINDER BLOCK WALL =	2334	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR
CORR MTL PNL WALL =		AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
CLR SGL PANE WINDOWS =	624	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR
METAL ROLL UP DOORS =	2112	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.07 MBTU / HR
MTL OVERHEAD DOORS =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
WOOD GLAZED O'HEAD DR =		AREA (SF) X	0.583	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
LG WOOD SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL PERSONNEL DR =	50	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
MTL/ GLAZED PERSONNEL =		AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
<b>TOTAL BASELINE HEAT LOSSES</b>				=	<b>0.30 MBTU / HR</b>
				=	<b>318.18 MJ/HR</b>

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 2764		BUILDING HEATING TEMPERATURE SETPOINT: 55 F					PAGE 2 OF 3			
		OUTSIDE DESIGN TEMPERATURE 1 F								
		TEMPERATURE DIFFERENCE 54 F								
INFILTRATION LOSSES =		1	AIR CHGS	X	76800	VOL (CU FT)	X 54 F TEMP DIFF	X 0.019	= 0.08	MBTU / HR
FLOOR LOSSES =		320	LINEAR FEET OF PERIMETER		X	54 F TEMP DIFF	X 0.81	= 0.01	MBTU / HR	
SURFACE HEAT LOSSES										
FLAT BUILT UP ROOF =		4800	AREA (SF)	X	0.105	U VALUE (BTU/HR -SF -F)	X 54 F TEMPERATURE DIFFERENCE	= 0.03	MBTU / HR	
FACE BRICK/BLK WALL =		0	AREA (SF)	X	0.176	U VALUE (BTU/HR -SF -F)	X 54 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR	
8" CINDER BLOCK WALL =		2334	AREA (SF)	X	0.389	U VALUE (BTU/HR -SF -F)	X 54 F TEMPERATURE DIFFERENCE	= 0.05	MBTU / HR	
CORR MTL PNL WALL =		0	AREA (SF)	X	0.17	U VALUE (BTU/HR -SF -F)	X 54 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR	
CLR SGL PANE WINDOWS =		624	AREA (SF)	X	1.235	U VALUE (BTU/HR -SF -F)	X 54 F TEMPERATURE DIFFERENCE	= 0.04	MBTU / HR	
METAL ROLL UP DOORS =		2112	AREA (SF)	X	0.56	U VALUE (BTU/HR -SF -F)	X 54 F TEMPERATURE DIFFERENCE	= 0.06	MBTU / HR	
MTL OVERHEAD DOORS =		0	AREA (SF)	X	0.56	U VALUE (BTU/HR -SF -F)	X 54 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR	
WOOD GLAZED O'HEAD DR =		0	AREA (SF)	X	0.583	U VALUE (BTU/HR -SF -F)	X 54 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR	
LG WOOD SLIDING DOOR =		0	AREA (SF)	X	0.56	U VALUE (BTU/HR -SF -F)	X 54 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR	
METAL PERSONNEL DR=		50	AREA (SF)	X	0.56	U VALUE (BTU/HR -SF -F)	X 54 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR	
MTL/ GLAZED PERSONNEL=		0	AREA (SF)	X	0.615	U VALUE (BTU/HR -SF -F)	X 54 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR	
TOTAL ECO HEAT LOSSES									= 0.28	MBTU / HR
									= 291.21	MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	BUILDING NUMBER	2764	GLOSSARY OF TERMS
SYSTEM EFFICIENCY	60%	90%	
OUTSIDE DESIGN TEMP (F)	1	1	
HTG TEMP SETPOINT (F)	60	55	
HEATING DEGREE DAYS	4616	3396	
TOTAL HEAT LOSSES	0.30	0.28	
(MBTU / HR)			
\$ /MBTU -FUEL OIL	\$6.60	\$6.60	
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62	
\$ /MBTU -PPG	\$10.84	\$10.84	

1 MBTU = 1055 MJ  
 0.019=CONSTANT  
 .81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE  
 CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS  
 65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.30	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	943.82	MBTU/YR
	0.6	SYS EFF	X	59	TEMP DIFFERENCE						
ECO - 1 =	943.82	MBTU/YR	X		CORR FACTOR		1		=	943.82	MBTU/YR
	0.28	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	462.91	MBTU/YR
	0.9	SYS EFF	X	54	TEMP DIFFERENCE						
	462.91	MBTU/YR	X		CORR FACTOR		1		=	462.91	MBTU/YR
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS	=								=	480.91	MBTU/YR
										507,357.33	MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	943.82	MBTU / YR	X	4.62	\$ /MBTU	=	4,360.46	\$ /YR
ECO - 1 =	462.91	MBTU / YR	X	4.62	\$ /MBTU	=	2,138.66	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS	=					=	2,221.79	\$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 1 OF 3

BUILDING NUMBER: 2765 BUILDING HEATING TEMPERATURE SETPOINT: 60 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 59 F

INFILTRATION LOSSES = 1 AIR CHGS X 76800 VOL (CU FT) X 59 F TEMP DIFF X 0.019 = 0.09 MBTU / HR

FLOOR LOSSES = 320 LINEAR FEET OF PERIMETER X 59 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	4800	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.03	MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2334	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
CORR MTL PNL WALL =		AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
CLR SGL PANE WINDOWS =	624	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
METAL ROLL UP DOORS =	2112	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.07	MBTU / HR
MTL OVERHEAD DOORS =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
WOOD GLAZED O'HEAD DR =		AREA (SF) X	0.583	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG WOOD SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR =	50	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/GLAZED PERSONNEL =		AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL BASELINE HEAT LOSSES

= 0.30 MBTU / HR  
= 318.18 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 2765 BUILDING HEATING TEMPERATURE SETPOINT: 55 F  
 OUTSIDE DESIGN TEMPERATURE 1 F  
 TEMPERATURE DIFFERENCE 54 F

INFILTRATION LOSSES = 1 AIR CHGS X 76800 VOL (CU FT) X 54 F TEMP DIFF X 0.019 = 0.08 MBTU / HR  
 FLOOR LOSSES = 320 LINEAR FEET OF PERIMETER X 54 F TEMP DIFF X 0.81 = 0.01 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	4800	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.03	MBTU / HR
FACE BRICK/BLK WALL =	0	AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2334	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
CORR MTL PNL WALL =	0	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
CLR SGL PANE WINDOWS =	624	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
METAL ROLL UP DOORS =	2112	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
MTL OVERHEAD DOORS =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
WOOD GLAZED O'HEAD DR =	0	AREA (SF) X	0.583	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG WOOD SLIDING DOOR =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR =	50	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL =	0	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL ECO HEAT LOSSES

= 0.28 MBTU / HR  
 = 291.21 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

BUILDING NUMBER	2765	GLOSSARY OF TERMS
1 MBTU = 1055 MJ		
0.019=CONSTANT		
.81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE		
CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS		
65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2		

	BASELINE	ECO - 1
SYSTEM EFFICIENCY	60%	90%
OUTSIDE DESIGN TEMP (F)	1	1
HTG TEMP SETPOINT (F)	60	55
HEATING DEGREE DAYS	4616	3396
TOTAL HEAT LOSSES (MBTU / HR)	0.30	0.28
\$ /MBTU -FUEL OIL	\$6.60	\$6.60
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62
\$ /MBTU -PPG	\$10.84	\$10.84

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.30	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	943.82	MBTU/YR
	0.6	SYS EFF	X	59	TEMP DIFFERENCE						
	943.82	MBTU/YR		X	CORR FACTOR		1		=		943.82
ECO - 1 =	0.28	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	462.91	MBTU/YR
	0.9	SYS EFF	X	54	TEMP DIFFERENCE						
	462.91	MBTU/YR		X	CORR FACTOR		1		=		462.91
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS											
									=	480.91	MBTU/YR
									=	507,357.33	MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	943.82	MBTU / YR	X	4.62	\$ /MBTU	=	4,360.46	\$ /YR
ECO - 1 =	462.91	MBTU / YR	X	4.62	\$ /MBTU	=	2,138.66	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS =								2,221.79 \$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 1 OF 3

BUILDING NUMBER: 2766 BUILDING HEATING TEMPERATURE SETPOINT: 60 F  
 OUTSIDE DESIGN TEMPERATURE 1 F  
 TEMPERATURE DIFFERENCE 59 F

INFILTRATION LOSSES = 1 AIR CHGS X 76800 VOL (CU FT) X 59 F TEMP DIFF X 0.019 = 0.09 MBTU / HR  
 FLOOR LOSSES = 320 LINEAR FEET OF PERIMETER X 59 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	4800	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.03	MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2334	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
CORR MTL PNL WALL =		AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
CLR SGL PANE WINDOWS =	624	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
METAL ROLL UP DOORS =	2112	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.07	MBTU / HR
MTL OVERHEAD DOORS =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
WOOD GLAZED O'HEAD DR =		AREA (SF) X	0.583	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG WOOD SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=	50	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/GLAZED PERSONNEL=		AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL BASELINE HEAT LOSSES

= 0.30 MBTU / HR  
 = 318.18 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 2766

BUILDING HEATING TEMPERATURE SETPOINT: 55 F

OUTSIDE DESIGN TEMPERATURE

1 F

TEMPERATURE DIFFERENCE

54 F

INFILTRATION LOSSES = 1 AIR CHGS X 76800 VOL (CU FT) X 54 F TEMP DIFF X 0.019 = 0.08 MBTU / HR

FLOOR LOSSES = 320 LINEAR FEET OF PERIMETER X 54 F TEMP DIFF X 0.81 = 0.01 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	4800	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.03	MBTU / HR
FACE BRICK/BLK WALL =	0	AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2334	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
CORR MTL PNL WALL =	0	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
CLR SGL PANE WINDOWS =	624	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
METAL ROLL UP DOORS =	2112	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
MTL OVERHEAD DOORS =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
WOOD GLAZED O'HEAD DR =	0	AREA (SF) X	0.583	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG WOOD SLIDING DOOR =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR =	50	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL / GLAZED PERSONNEL =	0	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL ECO HEAT LOSSES

= 0.28 MBTU / HR

= 291.21 MJ / HR



# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 2767		BUILDING HEATING TEMPERATURE SETPOINT: 60 F					PAGE 1 OF 3		
		OUTSIDE DESIGN TEMPERATURE					1 F		
		TEMPERATURE DIFFERENCE					59 F		
INFILTRATION LOSSES =	1	AIR CHGS	X	76800	VOL (CU FT)	X	59 F TEMP DIFF	X 0.019 = 0.09	MBTU / HR
FLOOR LOSSES =	320	LINEAR FEET OF PERIMETER		X	59 F TEMP DIFF	X 0.81 = 0.02	MBTU / HR		
SURFACE HEAT LOSSES									
FLAT BUILT UP ROOF =	4800	AREA (SF)	X	0.105	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE	= 0.03	MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF)	X	0.176	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR
8" CINDER BLOCK WALL =	2334	AREA (SF)	X	0.389	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE	= 0.05	MBTU / HR
CORR MTL PNL WALL =		AREA (SF)	X	0.17	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR
CLR SGL PANE WINDOWS =	624	AREA (SF)	X	1.235	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE	= 0.05	MBTU / HR
METAL ROLL UP DOORS =	2112	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE	= 0.07	MBTU / HR
MTL OVERHEAD DOORS =		AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR
WOOD GLAZED O'HEAD DR =		AREA (SF)	X	0.583	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR
LG WOOD SLIDING DOOR =		AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR
METAL PERSONNEL DR=	50	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR
MTL/ GLAZED PERSONNEL=		AREA (SF)	X	0.615	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR
TOTAL BASELINE HEAT LOSSES								= 0.30	MBTU / HR
								= 318.18	MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 2767

BUILDING HEATING TEMPERATURE SETPOINT: 55 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 54 F

INFILTRATION LOSSES = 1 AIR CHGS X 76800 VOL (CU FT) X 54 F TEMP DIFF X 0.019 = 0.08 MBTU / HR  
FLOOR LOSSES = 320 LINEAR FEET OF PERIMETER X 54 F TEMP DIFF X 0.81 = 0.01 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	4800	AREA (SF) X	0.105	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.03	MBTU / HR
FACE BRICK/BLK WALL =	0	AREA (SF) X	0.176	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2334	AREA (SF) X	0.389	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
CORR MTL PNL WALL =	0	AREA (SF) X	0.17	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
CLR SGL PANE WINDOWS =	624	AREA (SF) X	1.235	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
METAL ROLL UP DOORS =	2112	AREA (SF) X	0.56	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
MTL OVERHEAD DOORS =	0	AREA (SF) X	0.56	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
WOOD GLAZED O'HEAD DR =	0	AREA (SF) X	0.583	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG WOOD SLIDING DOOR =	0	AREA (SF) X	0.56	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR =	50	AREA (SF) X	0.56	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL =	0	AREA (SF) X	0.615	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL ECO HEAT LOSSES

= 0.28 MBTU / HR  
= 291.21 MJ/HR

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	ECO - 1	BUILDING NUMBER	2767
SYSTEM EFFICIENCY	60%	GLOSSARY OF TERMS	
OUTSIDE DESIGN TEMP (F)	1	1 MBTU = 1055 MJ	
HTG TEMP SETPOINT (F)	60	0.019=CONSTANT	
HEATING DEGREE DAYS	4616	.81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE	
TOTAL HEAT LOSSES (MBTU / HR)	0.30	CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS 65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2	

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.30	MBTU / HR		X	4616	DEGREE DAYS		X	24	HRS/DAY	=	943.82	MBTU/YR	MBTU/YR
		SYS EFF	X			59	TEMP DIFFERENCE							
	0.6													
	943.82		MBTU/YR		X		CORR FACTOR		1		=		943.82	MBTU/YR
ECO - 1 =	0.28		MBTU / HR		X	3396	DEGREE DAYS		X	24	HRS/DAY			
	0.9		SYS EFF		X	54	TEMP DIFFERENCE				=	462.91	MBTU/YR	
	462.91		MBTU/YR		X		CORR FACTOR		1		=		462.91	MBTU/YR
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS														
											=	480.91	MBTU/YR	MBTU/YR
											=	507,357.33	MJ/YR	MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	943.82	MBTU / YR X	4.62	\$ /MBTU	=	4,360.46	\$ /YR
ECO - 1 =	462.91	MBTU / YR X	4.62	\$ /MBTU	=	2,138.66	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS = 2,221.79 \$ /YR							

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 2778		BUILDING HEATING TEMPERATURE SETPOINT: 68 F		PAGE 1 OF 3	
		OUTSIDE DESIGN TEMPERATURE		1 F	
		TEMPERATURE DIFFERENCE		67 F	
INFILTRATION LOSSES =	1	AIR CHGS	X	1349500	VOL (CU FT) X 67 F TEMP DIFF X 0.019 = 1.72 MBTU / HR
FLOOR LOSSES =	1220	LINEAR FEET OF PERIMETER	X	67 F TEMP DIFF	X 0.81 = 0.07 MBTU / HR
<b>SURFACE HEAT LOSSES</b>					
FLAT BUILT UP ROOF =	49500	AREA (SF)	X	0.105	U VALUE (BTU/HR - SF - F) X 67 F TEMPERATURE DIFFERENCE = 0.35 MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF)	X	0.176	U VALUE (BTU/HR - SF - F) X 67 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
8" CINDER BLOCK WALL =	9371	AREA (SF)	X	0.389	U VALUE (BTU/HR - SF - F) X 67 F TEMPERATURE DIFFERENCE = 0.24 MBTU / HR
CORR MTL PNL WALL =	12120	AREA (SF)	X	0.4	U VALUE (BTU/HR - SF - F) X 67 F TEMPERATURE DIFFERENCE = 0.32 MBTU / HR
CLR SGL PANE WINDOWS =	5465	AREA (SF)	X	1.235	U VALUE (BTU/HR - SF - F) X 67 F TEMPERATURE DIFFERENCE = 0.45 MBTU / HR
METAL ROLL UP DOORS =	384	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F) X 67 F TEMPERATURE DIFFERENCE = 0.01 MBTU / HR
MTL OVERHEAD DOORS =	384	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F) X 67 F TEMPERATURE DIFFERENCE = 0.01 MBTU / HR
WOOD GLAZED O'HEAD DR =		AREA (SF)	X	0.583	U VALUE (BTU/HR - SF - F) X 67 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
LG WOOD SLIDING DOOR =		AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F) X 67 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL PERSONNEL DR =	100	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F) X 67 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
MTL/ GLAZED PERSONNEL =		AREA (SF)	X	0.615	U VALUE (BTU/HR - SF - F) X 67 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
<b>TOTAL BASELINE HEAT LOSSES</b>					<b>= 3.19 MBTU / HR</b>
					<b>= 3,361.42 MJ/HR</b>

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 2778

BUILDING HEATING TEMPERATURE SETPOINT: 55 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 54 F

INFILTRATION LOSSES = 1 AIR CHGS X 1349500 VOL (CU FT) X 54 F TEMP DIFF X 0.019 = 1.38 MBTU / HR

FLOOR LOSSES = 1220 LINEAR FEET OF PERIMETER X 54 F TEMP DIFF X 0.81 = 0.05 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	49500	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.28	MBTU / HR
FACE BRICK/BLK WALL =	0	AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	9371	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.20	MBTU / HR
CORR MTL PNL WALL =	12120	AREA (SF) X	0.4	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.26	MBTU / HR
CLR SGL PANE WINDOWS =	5465	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.36	MBTU / HR
METAL ROLL UP DOORS =	384	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
MTL OVERHEAD DOORS =	384	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
WOOD GLAZED O'HEAD DR =	0	AREA (SF) X	0.583	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG WOOD SLIDING DOOR =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=	100	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL=	0	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL ECO HEAT LOSSES

= 2.57 MBTU / HR  
= 2,709.20 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	BUILDING NUMBER	2778	GLOSSARY OF TERMS
SYSTEM EFFICIENCY	60%	90%	1 MBTU = 1055 MJ
OUTSIDE DESIGN TEMP (F)	1	55	0.019=CONSTANT
HTG TEMP SETPOINT (F)	68	3396	.81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE
HEATING DEGREE DAYS	4616	2.57	CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS
TOTAL HEAT LOSSES	3.19	\$6.60	65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2
(MBTU / HR)		\$4.62	
\$ /MBTU -FUEL OIL		\$10.84	
\$ /MBTU -NATURAL GAS			
\$ /MBTU -PPG			

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASLINE =	3.19	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	8,780.53	MBTU/YR
	0.6	SYS EFF	X	67	TEMP DIFFERENCE						
ECO - 1 =	8,780.53	MBTU/YR	X		CORR FACTOR	1			=	8,780.53	MBTU/YR
	2.57	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	4,306.57	MBTU/YR
	0.9	SYS EFF	X	54	TEMP DIFFERENCE						
	4,306.57	MBTU/YR	X		CORR FACTOR	1			=	4,306.57	MBTU/YR
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS									=	4,473.96	MBTU/YR
									=	4,720,030.49	MJ/YR

## ANNUAL HEATING ENERGY COST

BASLINE =	8,780.53	MBTU / YR	X	4.62	\$ /MBTU	=	40,566.06	\$ /YR
ECO - 1 =	4,306.57	MBTU / YR	X	4.62	\$ /MBTU	=	19,896.35	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS						=	20,669.71	\$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 2781		BUILDING HEATING TEMPERATURE SETPOINT: 66 F		PAGE 1 OF 3				
		OUTSIDE DESIGN TEMPERATURE		1 F				
		TEMPERATURE DIFFERENCE		65 F				
INFILTRATION LOSSES =	1	AIR CHGS X	479232	VOL (CU FT) X	65 F TEMP DIFF X 0.019 =	0.59	MBTU / HR	
FLOOR LOSSES =	1064	LINEAR FEET OF PERIMETER X	65 F TEMP DIFF X	0.81	=	0.06	MBTU / HR	
<b>SURFACE HEAT LOSSES</b>								
FLAT BUILT UP ROOF =	29952	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	65 F TEMPERATURE DIFFERENCE	=	0.20	MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	65 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	15393	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	65 F TEMPERATURE DIFFERENCE	=	0.39	MBTU / HR
CORR MTL PNL WALL =		AREA (SF) X	0.4	U VALUE (BTU/HR - SF - F) X	65 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
CLR SGL PANE WINDOWS =	80	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	65 F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
METAL ROLL UP DOORS =	1331	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	65 F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
MTL OVERHEAD DOORS =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	65 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
WOOD GLAZED O'HEAD DR =		AREA (SF) X	0.583	U VALUE (BTU/HR - SF - F) X	65 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG MTL SLIDING DOOR =	121	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	65 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR =	100	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	65 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL =		AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	65 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
<b>TOTAL BASELINE HEAT LOSSES</b>						=	<b>1.30</b>	<b>MBTU / HR</b>
						=	<b>1,376.16</b>	<b>MJ/HR</b>

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 2781

BUILDING HEATING TEMPERATURE SETPOINT: 55 F

OUTSIDE DESIGN TEMPERATURE

1 F  
54 F

TEMPERATURE DIFFERENCE

INFILTRATION LOSSES = 1 AIR CHGS X 479232 VOL (CU FT) X 54 F TEMP DIFF X 0.019 = 0.49 MBTU / HR

FLOOR LOSSES = 1064 LINEAR FEET OF PERIMETER X 54 F TEMP DIFF X 0.81 = 0.05 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	29952	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.17	MBTU / HR
FACE BRICK/BLK WALL =	0	AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	15393	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.32	MBTU / HR
CORR MTL PNL WALL =	0	AREA (SF) X	0.4	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
CLR SGL PANE WINDOWS =	80	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
METAL ROLL UP DOORS =	1331	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
MTL OVERHEAD DOORS =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
WOOD GLAZED O'HEAD DR =	0	AREA (SF) X	0.583	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG WOOD SLIDING DOOR =	121	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=	100	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL=	0	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL ECO HEAT LOSSES

= 1.08 MBTU / HR  
= 1,143.27 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

BUILDING NUMBER	2781	GLOSSARY OF TERMS
1 MBTU = 1055 MJ		
0.019=CONSTANT		
.81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE		
CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS		
65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2		

SYSTEM EFFICIENCY	BASELINE	ECO - 1
OUTSIDE DESIGN TEMP (F)	60%	90%
HTG TEMP SETPOINT (F)	1	1
HEATING DEGREE DAYS	66	55
TOTAL HEAT LOSSES	4616	3396
(MBTU / HR)	1.30	1.08
\$ /MBTU -FUEL OIL	\$6.60	\$6.60
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62
\$ /MBTU -PPG	\$10.84	\$10.84

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	1.30	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	3,705.36	MBTU/YR
	0.6	SYS EFF	X	65	TEMP DIFFERENCE						
	3,705.36	MBTU/YR		X	CORR FACTOR		1		=		3,705.36
ECO - 1 =	1.08	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	1,817.36	MBTU/YR
	0.9	SYS EFF	X	54	TEMP DIFFERENCE						
	1,817.36	MBTU/YR		X	CORR FACTOR		1		=		1,817.36
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS											
									=	1,888.00	MBTU/YR
									=	1,991,837.80	MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	3,705.36	MBTU / YR	X	4.62	\$ /MBTU	=	17,118.75	\$ /YR
	.						.	
ECO - 1 =	1,817.36	MBTU / YR	X	4.62	\$ /MBTU	=	8,396.20	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS = 8,722.55 \$ /YR								

LIFE CYCLE COST ANALYSIS SUMMARY

STUDY: 2770ECO1  
LCCID 1.080

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

INSTALLATION & LOCATION: FORT KNOX      REGION NOS. 4 CENSUS: 3

PROJECT NO. & TITLE: 2770ECO1      ECO-1 INFRARED HEAT

FISCAL YEAR 95      DISCRETE PORTION NAME: INFRARED

ANALYSIS DATE: 10-18-94      ECONOMIC LIFE 20 YEARS PREPARED BY: JAH

1. INVESTMENT

A. CONSTRUCTION COST	\$	246635.	
B. SIOH	\$	12332.	
C. DESIGN COST	\$	12332.	
D. TOTAL COST (1A+1B+1C)	\$	271299.	
E. SALVAGE VALUE OF EXISTING EQUIPMENT	\$	0.	
F. PUBLIC UTILITY COMPANY REBATE	\$	0.	
G. TOTAL INVESTMENT (1D - 1E - 1F)	\$		271299.

2. ENERGY SAVINGS (+) / COST (-)

DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTORS OCT 1993

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR (2)	ANNUAL \$ SAVINGS (3)	DISCOUNT FACTOR (4)	DISCOUNTED SAVINGS (5)
A. ELECT	\$ .00	0.	\$ 0.	15.61	\$ 0.
B. DIST	\$ 6.60	0.	\$ 0.	17.56	\$ 0.
C. RESID	\$ .00	0.	\$ 0.	19.97	\$ 0.
D. NAT G	\$ 4.62	14847.	\$ 68594.	20.96	\$ 1437728.
E. COAL	\$ .00	0.	\$ 0.	17.58	\$ 0.
F. LPG	\$ .00	0.	\$ 0.	16.12	\$ 0.
M. DEMAND SAVINGS			\$ 0.	14.74	\$ 0.
N. TOTAL		14847.	\$ 68594.		\$ 1437728.

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)

(1) DISCOUNT FACTOR (TABLE A) 14.74 \$ 1980.

(2) DISCOUNTED SAVING/COST (3A X 3A1) \$ 29185.

B. NON RECURRING SAVINGS (+) / COSTS (-)

ITEM	SAVINGS (+) COST (-) (1)	YR OC (2)	DISCNT FACTR (3)	DISCOUNTED SAVINGS (+) / COST (-) (4)
1. REPAIR	\$ 22621.	5	.86	19454.
2. REPAIR2	\$ 22621.	15	.63	14251.
3. REPAIR3	\$ 6423.	7	.81	5202.
4. REPAIR4	\$ 6423.	14	.65	4175.

d. TOTAL \$ 58088. 43083.

C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+) / COST (-) (3A2+3Bd4) \$ 72268.

4. FIRST YEAR DOLLAR SAVINGS  $2N3+3A+(3Bd1/(YRS \text{ ECONOMIC LIFE}))$  \$ 73478.

5. SIMPLE PAYBACK PERIOD (1G/4) 3.69 YEARS

6. TOTAL NET DISCOUNTED SAVINGS (2N5+3C) \$ 1509995.

7. SAVINGS TO INVESTMENT RATIO (SIR) = (6 / 1G) = 5.57  
(IF < 1 PROJECT DOES NOT QUALIFY)

8. ADJUSTED INTERNAL RATE OF RETURN (AIRR): 12.34 %

```

=====
Estimate:      BLDG 2770          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   *****          City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					1800.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		270.00	\$0	\$5,681	\$2,313	\$0	\$7,994
0207180380	HVAC DEMO, BOILER GAS/OIL STL >150MBH					2.00 Ea.	
Unit values		12.00	0.00	323.82	0.00	0.00	323.82
Totals		24.00	\$0	\$648	\$0	\$0	\$648
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					5.00 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		72.73	\$0	\$1,902	\$0	\$0	\$1,902
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					1800.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		127.80	\$0	\$3,553	\$426	\$0	\$3,979
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					200.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		40.00	\$0	\$1,110	\$136	\$0	\$1,246
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520600	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 2" DIAM					150.00 L.F.	
Unit values		0.11	2.19	3.18	0.19	0.00	5.55
Totals		17.10	\$328	\$476	\$28	\$0	\$832
U02 SITEWORK		554	\$588	\$13,405	\$2,909	\$0	\$16,902

```
=====
Line #      Description
-----
              Manhours   Matl      Labor    Equipment    Sub      Total
=====
```

1554510245 HTG INFA-RD UNT GAS ELEC IGN (See Attached for Breakdown)  
1.00 LS  
Unit values 0.00 0.00 0.00 0.00 188191.00 188191.00  
Totals 0.00 \$0 \$0 \$0 \$188,191 \$188,191

1562600139 GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM  
TYPE 2" PIPE SIZE 1.00 Ea.  
Unit values 0.73 420.00 16.42 0.00 0.00 436.42  
Totals 0.73 \$420 \$16 \$0 \$0 \$436

U15 MECHANICAL 1 \$420 \$16 \$0 \$188,191 \$188,627

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====

ESTIMATE TOTAL      555    $1,008    $13,421    $2,909    $188,191    $205,529

SALES TAX            0.00%           $0
MATL MARKUP          0.00%           $0
LABOR MARKUP         0.00%           $0
EQUIPT MARKUP        0.00%           $0
SUB MARKUP           0.00%           $0

TOTAL BEFORE CONTINGENC  $1,008    $13,421    $2,909    $188,191    $205,529
CONTINGENCY          10.00%           $20,553
BOND                 0.00%           $0
PROFIT               10.00%           $20,553

JOB TOTAL                                $246,635
=====
```

```

=====
Estimate:      BLDG 2770           Date:      14-Oct-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY       Job #:      94013.02
Sq. footage:   *****           City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
U02 SITEWORK      554    $588  $13,405    $2,909    $0    $16,902
U15 MECHANICAL     1    $420    $16        $0    $188,191  $188,627
TOTAL             555    $1,008  $13,421    $2,909  $188,191  $205,529

SALES TAX          0.00%    $0
MATL MARKUP        0.00%    $0
LABOR MARKUP       0.00%    $0
EQUIPT MARKUP      0.00%    $0
SUB MARKUP         0.00%    $0

TOTAL BEFORE CONTINGENC  $1,008  $13,421  $2,909  $188,191  $205,529
CONTINGENCY         10.00%    $20,553
BOND                 0.00%    $0
PROFIT               10.00%    $20,553
JOB TOTAL                                     $246,635
=====

```

```
=====
Estimate:      BLDG 2770      Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY   Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====
```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					3500.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		521.50	\$7,755	\$16,004	\$0	\$0	\$23,759
A09 ELECTRICAL		522	\$7,755	\$16,004	\$0	\$0	\$23,759

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					3300.00 L.F.	
Unit values		0.44	4.17	10.30	0.00	0.00	14.47
Totals		1465.20	\$13,761	\$33,998	\$0	\$0	\$47,759
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNCR SZD FOR CVRG 10' OC 1/2" DIAM					3400.00 L.F.	
Unit values		0.13	1.64	2.88	0.00	0.00	4.52
Totals		431.80	\$5,576	\$9,777	\$0	\$0	\$15,353
1519010320	ALUMINUM REFLECTORS W/HANGERS					456.00 Ea.	
Unit values		0.50	39.79	3.80	0.00	0.00	43.59
Totals		228.00	\$18,144	\$1,735	\$0	\$0	\$19,879
1524105040	VACUUM PUMP AND VENT PIPING					12.00 Ea.	
Unit values		3.00	738.35	120.15	0.00	0.00	858.50
Totals		36.00	\$8,860	\$1,442	\$0	\$0	\$10,302
1552301020	CRV-100 GAS FIRED BURNER 100 MBH & COMBUSTION CHAMBER					72.00 Ea.	
Unit values		1.00	860.00	44.06	0.00	0.00	904.06
Totals		72.00	\$61,920	\$3,172	\$0	\$0	\$65,092
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					12.00 Ea.	
Unit values		1.00	75.00	27.55	0.00	0.00	102.55
Totals		12.00	\$900	\$331	\$0	\$0	\$1,231
U15 MECHANICAL		2245	\$109,161	\$50,455	\$0	\$0	\$159,616

```
=====
Line #      Description
-----
            Manhours  Matl    Labor  Equipment  Sub      Total
=====

1631200100  HEATING SYSTEM POWER / CONTROL PANEL
                                12.00 Ea.
Unit values      2.96    330.76    70.58      0.00      0.00    401.34
Totals           35.56    $3,969    $847        $0        $0    $4,816

U16 ELECTRICAL      36    $3,969    $847        $0        $0    $4,816
```

```
=====
Line #      Description
-----
              Manhours   Matl     Labor   Equipment   Sub      Total
=====
```

ESTIMATE TOTAL	2803	\$120,885	\$67,306	\$0	\$0	\$188,191
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$120,885	\$67,306	\$0	\$0	\$188,191
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$188,191

```

=====
Estimate:      BLDG 2770          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
A09 ELECTRICAL      522    $7,755    $16,004          $0    $0    $23,759
U15 MECHANICAL     2245   $109,161   $50,455          $0    $0   $159,616
U16 ELECTRICAL       36    $3,969     $847            $0    $0    $4,816

TOTAL              2803   $120,885   $67,306          $0    $0   $188,191

SALES TAX           0.00%         $0
MATL MARKUP         0.00%         $0
LABOR MARKUP        0.00%          $0
EQUIPT MARKUP       0.00%          $0
SUB MARKUP          0.00%          $0

TOTAL BEFORE CONTINGENC $120,885   $67,306          $0    $0   $188,191
CONTINGENCY          0.00%          $0
BOND                 0.00%          $0
PROFIT               0.00%          $0

JOB TOTAL                                     $188,191
=====

```

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 2770										BUILDING HEATING TEMPERATURE SETPOINT: 68 F										PAGE 1 OF 3									
										OUTSIDE DESIGN TEMPERATURE 1 F																			
										TEMPERATURE DIFFERENCE 67 F																			
INFILTRATION LOSSES =										1	AIR CHGS		X	3780000	VOL (CU FT)		X	67	F TEMP DIFF		X	0.019	=	4.81	MBTU / HR				
FLOOR LOSSES =										2050	LINEAR FEET OF PERIMETER		X	67	F TEMP DIFF		X	0.81	=	0.11	MBTU / HR								
SURFACE HEAT LOSSES																													
FLAT BUILT UP ROOF =										112500	AREA (SF)		X	0.105	U VALUE (BTU/HR - SF - F)		X	67	F TEMPERATURE DIFFERENCE		=	0.79	MBTU / HR						
FACE BRICK/BLK WALL =											AREA (SF)		X	0.176	U VALUE (BTU/HR - SF - F)		X	67	F TEMPERATURE DIFFERENCE		=	0.00	MBTU / HR						
8" CINDER BLOCK WALL =										30089	AREA (SF)		X	0.389	U VALUE (BTU/HR - SF - F)		X	67	F TEMPERATURE DIFFERENCE		=	0.78	MBTU / HR						
CORR MTL PNL WALL =											AREA (SF)		X	0.17	U VALUE (BTU/HR - SF - F)		X	67	F TEMPERATURE DIFFERENCE		=	0.00	MBTU / HR						
CLR SGL PANE WINDOWS =										48360	AREA (SF)		X	1.235	U VALUE (BTU/HR - SF - F)		X	67	F TEMPERATURE DIFFERENCE		=	4.00	MBTU / HR						
METAL ROLL UP DOORS =										1950	AREA (SF)		X	0.56	U VALUE (BTU/HR - SF - F)		X	67	F TEMPERATURE DIFFERENCE		=	0.07	MBTU / HR						
MTL OVERHEAD DOORS =											AREA (SF)		X	0.56	U VALUE (BTU/HR - SF - F)		X	67	F TEMPERATURE DIFFERENCE		=	0.00	MBTU / HR						
WOOD GLAZED O'HEAD DR =											AREA (SF)		X	0.583	U VALUE (BTU/HR - SF - F)		X	67	F TEMPERATURE DIFFERENCE		=	0.00	MBTU / HR						
LG WOOD SLIDING DOOR =											AREA (SF)		X	0.56	U VALUE (BTU/HR - SF - F)		X	67	F TEMPERATURE DIFFERENCE		=	0.00	MBTU / HR						
METAL PERSONNEL DR=											AREA (SF)		X	0.56	U VALUE (BTU/HR - SF - F)		X	67	F TEMPERATURE DIFFERENCE		=	0.00	MBTU / HR						
MTL/ GLAZED PERSONNEL=											AREA (SF)		X	0.615	U VALUE (BTU/HR - SF - F)		X	67	F TEMPERATURE DIFFERENCE		=	0.00	MBTU / HR						
TOTAL BASELINE HEAT LOSSES																													
= 10.57 MBTU / HR																													
= 11,155.10 MJ/HR																													

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 2770

BUILDING HEATING TEMPERATURE SETPOINT: 55 F

OUTSIDE DESIGN TEMPERATURE

1 F

TEMPERATURE DIFFERENCE

54 F

INFILTRATION LOSSES = 1 AIR CHGS X 3780000 VOL (CU FT) X 54 F TEMP DIFF X 0.019 = 3.88 MBTU / HR

FLOOR LOSSES = 2050 LINEAR FEET OF PERIMETER X 54 F TEMP DIFF X 0.81 = 0.09 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	112500	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.64	MBTU / HR
FACE BRICK/BLK WALL =	0	AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	30089	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.63	MBTU / HR
CORR MTL PNL WALL =	0	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
CLR SGL PANE WINDOWS =	48360	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	3.23	MBTU / HR
METAL ROLL UP DOORS =	1950	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
MTL OVERHEAD DOORS =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
WOOD GLAZED O'HEAD DR =	0	AREA (SF) X	0.583	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG WOOD SLIDING DOOR =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL =	0	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL ECO HEAT LOSSES

= 8.52 MBTU / HR

= 8,990.68 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	BASELINE	ECO - 1
SYSTEM EFFICIENCY	60%	90%
OUTSIDE DESIGN TEMP (F)	1	1
HTG TEMP SETPOINT (F)	68	55
HEATING DEGREE DAYS	4616	3396
TOTAL HEAT LOSSES (MBTU / HR)	10.57	8.52
\$ /MBTU -FUEL OIL	\$6.60	\$6.60
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62
\$ /MBTU -PPG	\$10.84	\$10.84

BUILDING NUMBER 2770

### GLOSSARY OF TERMS

1 MBTU = 1055 MJ  
 0.019=CONSTANT  
 .81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE  
 CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS  
 65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	10.57	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY			
	0.6	SYS EFF	X	67	TEMP DIFFERENCE				=	29,138.82	MBTU/YR
	29,138.82	MBTU/YR		X	CORR FACTOR		1		=	29,138.82	MBTU/YR
ECO - 1 =	8.52	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY			
	0.9	SYS EFF	X	54	TEMP DIFFERENCE				=	14,291.66	MBTU/YR
	14,291.66	MBTU/YR		X	CORR FACTOR		1		=	14,291.66	MBTU/YR
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS											
									=	14,847.16	MBTU/YR
									=	15,663,755.82	MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	29,138.82	MBTU / YR	X	4.62	\$ /MBTU	=	134,621.34	\$ /YR
ECO - 1 =	14,291.66	MBTU / YR	X	4.62	\$ /MBTU	=	66,027.45	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS =							68,593.89	\$ /YR

LIFE CYCLE COST ANALYSIS SUMMARY

STUDY: 2942ECO1  
LCCID 1.080

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

INSTALLATION & LOCATION: FORT KNOX      REGION NOS. 4      CENSUS: 3

PROJECT NO. & TITLE: 2942ECO1      ECO-1 INFRARED HEAT

FISCAL YEAR 95      DISCRETE PORTION NAME: INFRARED

ANALYSIS DATE: 10-18-94      ECONOMIC LIFE 20 YEARS PREPARED BY: JAH

1. INVESTMENT

A. CONSTRUCTION COST	\$	205587.	
B. SIOH	\$	10279.	
C. DESIGN COST	\$	10279.	
D. TOTAL COST (1A+1B+1C)	\$	226146.	
E. SALVAGE VALUE OF EXISTING EQUIPMENT	\$	0.	
F. PUBLIC UTILITY COMPANY REBATE	\$	0.	
G. TOTAL INVESTMENT (1D - 1E - 1F)	\$		226146.

2. ENERGY SAVINGS (+) / COST (-)

DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTORS OCT 1993

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ .00	0.	\$ 0.	15.61	\$ 0.
B. DIST	\$ 6.60	8544.	\$ 56387.	17.56	\$ 990159.
C. RESID	\$ .00	0.	\$ 0.	19.97	\$ 0.
D. NAT G	\$ 4.62	-4190.	\$ -19359.	20.96	\$ -405770.
E. COAL	\$ .00	0.	\$ 0.	17.58	\$ 0.
F. LPG	\$ .00	0.	\$ 0.	16.12	\$ 0.
M. DEMAND SAVINGS			\$ 0.	14.74	\$ 0.
N. TOTAL		4353.	\$ 37028.		\$ 584389.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)

(1) DISCOUNT FACTOR (TABLE A) 14.74

(2) DISCOUNTED SAVING/COST (3A X 3A1) \$ 43778.

B. NON RECURRING SAVINGS(+) / COSTS(-)

ITEM	SAVINGS(+) COST(-) (1)	YR OC (2)	DISCNT FACTOR (3)	DISCOUNTED SAVINGS(+)/ COST(-) (4)
1. REPAIR	\$ 11089.	5	.86	9536.
2. REPAIR2	\$ 11089.	15	.63	6986.
3. REPAIR3	\$ 2727.	7	.81	2209.
4. REPAIR4	\$ 2727.	14	.65	1773.
5. ENVIR	\$ 63703.	3	.91	57970.
d. TOTAL	\$ 91335.			78474.

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-) (3A2+3Bd4) \$ 122252.

4. FIRST YEAR DOLLAR SAVINGS  $2N3+3A+(3Bd1/(YRS \text{ ECONOMIC LIFE}))$  \$ 44565.

5. SIMPLE PAYBACK PERIOD (1G/4) 5.07 YEARS

6. TOTAL NET DISCOUNTED SAVINGS (2N5+3C) \$ 706641.

7. SAVINGS TO INVESTMENT RATIO (SIR) =  $(6 / 1G) =$  3.12  
(IF < 1 PROJECT DOES NOT QUALIFY)

8. ADJUSTED INTERNAL RATE OF RETURN (AIRR): 9.14 %

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=====
Estimate:      294X AREA          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP (GLASS Bid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    MAIN GAS LINE     City indx: Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205542200	SITE DEMOLITION, PAVEMENT, CONCRETE, TO 24" THICK, REINFORCED					52.00 C.Y.	
Unit values		4.21	0.00	92.52	133.64	0.00	226.16
Totals		218.97	\$0	\$4,811	\$6,949	\$0	\$11,760
0222541900	TAMPING TRENCH B'FILL, VIBRATING PLATE, ADD					52.00 C.Y.	
Unit values		0.09	0.00	1.74	0.67	0.00	2.41
Totals		4.63	\$0	\$90	\$35	\$0	\$125
0222582800	TRENCH EXCVTNG 40HP CHNTRNCHR&BKFL 12"W24"D					700.00 L.F.	
Unit values		0.01	0.00	0.24	0.24	0.00	0.47
Totals		7.00	\$0	\$166	\$166	\$0	\$332
0251200400	CONCRETE PAVING, JOINTS/FINISH, 4500 PSI CONCRETE, 12" THICK					78.00 S.Y.	
Unit values		0.05	17.52	1.07	1.02	0.00	19.61
Totals		3.82	\$1,367	\$83	\$79	\$0	\$1,529
0260120200	BEDDING, FOR PIPE IN TRENCH SAND, DEAD OR BANK					13.00 C.Y.	
Unit values		0.16	2.43	3.37	1.37	0.00	7.17
Totals		2.08	\$32	\$44	\$18	\$0	\$94
0260120500	BEDDING, PLACING IN TRENCH					13.00 C.Y.	
Unit values		0.09	0.00	1.74	0.67	0.00	2.41
Totals		1.16	\$0	\$23	\$9	\$0	\$32
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520200	GAS SERVICE & DISTRIB PIPING, POLYETHYLENE, 60- PSI 2" DIAM COIL SDR 11					700.00 L.F.	
Unit values		0.07	0.75	1.48	0.00	0.00	2.23
Totals		46.90	\$527	\$1,036	\$0	\$0	\$1,563

17-Oct-94

MeansData for Lotus

Page 2

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=====
Line #      Description
-----
              Manhours  Matl    Labor  Equipment  Sub    Total
=====
U02 SITEWORK      287    $2,186    $6,288    $7,262      $0    $15,736
1562600139      GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
                TYPE 2" PIPE SIZE
Unit values      0.73    420.00    16.42      0.00      0.00    436.42
Totals           0.73    $420      $16        $0        $0      $436

U15 MECHANICAL      1      $420      $16        $0        $0      $436
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=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub  .  Total
=====
```

ESTIMATE TOTAL	288	\$2,606	\$6,304	\$7,262	\$0	\$16,172
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$2,606	\$6,304	\$7,262	\$0	\$16,172
CONTINGENCY	10.00%					\$1,617
BOND	0.00%					\$0
PROFIT	10.00%					\$1,617
JOB TOTAL						\$19,406

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=====
Estimate:      294X AREA          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP (GLASS Bid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   MAIN GAS LINE      City indx: Louisville, KY
=====

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## SUMMARY

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=====
              Manhours   Matl     Labor   Equipment   Sub       Total
=====
U02 SITEWORK      287     $2,186   $6,288   $7,262       $0    $15,736
U15 MECHANICAL      1       $420     $16      $0           $0     $436
TOTAL              288     $2,606   $6,304   $7,262       $0    $16,172

SALES TAX          0.00%       $0
MATL MARKUP        0.00%       $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC $2,606   $6,304   $7,262       $0    $16,172
CONTINGENCY        10.00%      $1,617
BOND               0.00%       $0
PROFIT            10.00%      $1,617

JOB TOTAL                                     $19,406
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Estimate:      BLDG 2942          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED BEAP (GLASS Bid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    *****          City indx: Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205542200	SITE DEMOLITION, PAVEMENT, CONCRETE, TO 24" THICK, REINFORCED					10.00 C.Y.	
Unit values	4.21	0.00	92.52	133.64	0.00		226.16
Totals	42.11	\$0	\$925	\$1,336	\$0		\$2,261
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					500.00 L.F.	
Unit values	0.15	0.00	3.16	1.29	0.00		4.44
Totals	75.00	\$0	\$1,578	\$643	\$0		\$2,221
0207180380	HVAC DEMO, BOILER GAS/OIL STL >150MBH					1.00 Ea.	
Unit values	12.00	0.00	323.82	0.00	0.00		323.82
Totals	12.00	\$0	\$324	\$0	\$0		\$324
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					1.00 Ton	
Unit values	14.55	0.00	380.36	0.00	0.00		380.36
Totals	14.55	\$0	\$380	\$0	\$0		\$380
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					300.00 L.F.	
Unit values	0.07	0.00	1.97	0.24	0.00		2.21
Totals	21.30	\$0	\$592	\$71	\$0		\$663
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					100.00 Ea.	
Unit values	0.20	0.00	5.55	0.68	0.00		6.23
Totals	20.00	\$0	\$555	\$68	\$0		\$623
0222541900	TAMPING TRENCH B'FILL, VIBRATING PLATE, ADD					10.00 C.Y.	
Unit values	0.09	0.00	1.74	0.67	0.00		2.41
Totals	0.89	\$0	\$17	\$7	\$0		\$24
0222582800	TRENCH EXCVTNG 40HP CHNTRNCHR&BKFL 12"W24"D					130.00 L.F.	
Unit values	0.01	0.00	0.24	0.24	0.00		0.47
Totals	1.30	\$0	\$31	\$31	\$0		\$62
0251200400	CONCRETE PAVING, JOINTS/FINISH, 4500 PSI CONCRETE, 12" THICK					14.50 S.Y.	

Unit values	0.05	17.52	1.07	1.02	0.00	19.61
Totals	0.71	\$254	\$16	\$15	\$0	\$285
0260120200	BEDDING, FOR PIPE IN TRENCH SAND, DEAD OR BANK					
Unit values	0.16	2.43	3.37	1.37	2.50 C.Y.	7.17
Totals	0.40	\$6	\$8	\$3	\$0	\$17
0260120500	BEDDING, PLACING IN TRENCH					
Unit values	0.09	0.00	1.74	0.67	2.50 C.Y.	2.41
Totals	0.22	\$0	\$4	\$2	\$0	\$6
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					
Unit values	1.56	259.60	35.47	5.91	1.00 Ea.	300.98
Totals	1.56	\$260	\$35	\$6	\$0	\$301
0268520200	GAS SERVICE & DISTRIB PIPING, POLYETHYLENE, 60-PSI 2" DIAM COIL SDR 11					
Unit values	0.07	0.75	1.48	0.00	130.00 L.F.	2.23
Totals	8.71	\$98	\$192	\$0	\$0	\$290
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1"DIAM					
Unit values	0.11	1.92	2.96	0.17	50.00 L.F.	5.06
Totals	5.35	\$96	\$148	\$9	\$0	\$253

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=====
Line #      Description
-----
              Manhours  Matl    Labor  Equipment  Sub    Total
=====
U02 SITEWORK      205      $714    $4,805    $2,191      $0    $7,710

1554510245      HTG INFA-RD UNT GAS ELEC IGN (See Attached for Breakdown)
                                1.00 LS
Unit values      8.00    760.00    163.40      0.00  35046.00  35969.40
Totals           8.00      $760      $163      $0    $35,046    $35,969

1562600137      GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
              TYPE 1-1/4" PIPE SIZE                                1.00 Ea.
Unit values      0.53    226.00    12.10      0.00      0.00    238.10
Totals           0.53      $226      $12      $0      $0      $238

1562600138      GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
              TYPE 1-1/2" PIPE SIZE                                (qty) Ea.
Unit values      0.62    420.00    13.94      0.00      0.00    433.94
Totals           0.00      $0      $0      $0      $0      $0

1562600139      GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
              TYPE 2" PIPE SIZE                                1.00 Ea.
Unit values      0.73    420.00    16.42      0.00      0.00    436.42
Totals           0.73      $420      $16      $0      $0      $436

U15 MECHANICAL    10      $1,406    $191      $0    $35,046    $36,643

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=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	215	\$2,120	\$4,996	\$2,191	\$35,046	\$44,353
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$2,120	\$4,996	\$2,191	\$35,046	\$44,353
CONTINGENCY	10.00%					\$4,435
BOND	0.00%					\$0
PROFIT	10.00%					\$4,435
JOB TOTAL						\$53,224

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=====
Estimate:      BLDG 2942          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   *****          City indx:Louisville, KY
=====

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## SUMMARY

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-----
Manhours  Matl  Labor  Equipment  Sub  Total
=====
U02 SITEWORK      205      $714    $4,805    $2,191      $0    $7,710
U15 MECHANICAL    10     $1,406     $191      $0    $35,046    $36,643
TOTAL              215     $2,120    $4,996    $2,191    $35,046    $44,353

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC $2,120    $4,996    $2,191    $35,046    $44,353
CONTINGENCY        10.00%      $4,435
BOND                0.00%      $0
PROFIT             10.00%      $4,435
JOB .TOTAL                          $53,224

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=====
Estimate:      BLDG 2942          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

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Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					370.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		55.13	\$820	\$1,692	\$0	\$0	\$2,512
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					200.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		29.80	\$443	\$914	\$0	\$0	\$1,357
A09 ELECTRICAL		85	\$1,263	\$2,606	\$0	\$0	\$3,869

=====						
Line #	Description					
	Manhours	Matl	Labor	Equipment	Sub	Total
=====						
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					
Unit values	0.44	4.17	10.30	0.00	370.00 L.F.	
Totals	164.28	\$1,543	\$3,812	\$0	0.00	14.47
					\$0	\$5,355
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNGR SZD FOR CVRG 10' OC 1/2" DIAM					
Unit values	0.13	1.64	2.88	0.00	570.00 L.F.	
Totals	72.39	\$935	\$1,639	\$0	0.00	4.52
					\$0	\$2,574
1519010320	ALUMINUM REFLECTORS W/HANGERS					
Unit values	0.50	39.79	3.80	0.00	56.00 Ea.	
Totals	28.00	\$2,228	\$213	\$0	0.00	43.59
					\$0	\$2,441
1524105040	VACUUM PUMP AND VENT PIPING					
Unit values	3.00	738.35	120.15	0.00	2.00 Ea.	
Totals	6.00	\$1,477	\$240	\$0	0.00	858.50
					\$0	\$1,717
1552301020	GAS FIRED BURNER 100 MBH & COMBUSTION CHAMBER					
Unit values	1.00	860.00	44.06	0.00	6.00 Ea.	
Totals	6.00	\$5,160	\$264	\$0	0.00	904.06
					\$0	\$5,424
1554510160	CO RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 40MBH					
Unit values	4.00	935.00	81.70	0.00	10.00 Ea.	
Totals	40.00	\$9,350	\$817	\$0	0.00	1016.70
					\$0	\$10,167
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					
Unit values	1.60	70.00	76.50	0.00	10.00 Ea.	
Totals	16.00	\$700	\$765	\$0	0.00	146.50
					\$0	\$1,465
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					
Unit values	1.00	75.00	27.55	0.00	12.00 Ea.	
Totals	12.00	\$900	\$331	\$0	0.00	102.55
					\$0	\$1,231
U15 MECHANICAL	345	\$22,293	\$8,081	\$0	\$0	\$30,374

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=====
Line #      Description
-----
            Manhours  Matl    Labor  Equipment  Sub      Total
=====
```

1631200100      HEATING SYSTEM POWER / CONTROL PANEL

Unit values	2.96	330.76	70.58	0.00	2.00 Ea. 0.00	401.34
Totals	5.93	\$662	\$141	\$0	\$0	\$803

U16 ELECTRICAL	6	\$662	\$141	\$0	\$0	\$803
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=====
Line #      Description
-----
      Manhours   Matl    Labor   Equipment   Sub    Total
=====
```

ESTIMATE TOTAL	436	\$24,218	\$10,828	\$0	\$0	\$35,046
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$24,218	\$10,828	\$0	\$0	\$35,046
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$35,046

```

=====
Estimate:      BLDG 2942          Date:      14-Oct-94
Description:   INFRARED HEATING SYSTEM COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY      Job #:      94013.02
Sq. footage:  City indx:Louisville, KY
=====

```

## SUMMARY

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=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
A09 ELECTRICAL      85    $1,263    $2,606          $0    $0    $3,869
U15 MECHANICAL     345    $22,293    $8,081          $0    $0    $30,374
U16 ELECTRICAL       6      $662      $141          $0    $0     $803

TOTAL              436    $24,218    $10,828          $0    $0    $35,046

SALES TAX           0.00%          $0
MATL MARKUP         0.00%          $0
LABOR MARKUP        0.00%          $0
EQUIPT MARKUP       0.00%          $0
SUB MARKUP          0.00%          $0

TOTAL BEFORE CONTINGENC $24,218    $10,828          $0    $0    $35,046
CONTINGENCY          0.00%
BOND                 0.00%
PROFIT               0.00%

JOB TOTAL                                          $35,046
=====

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=====
Estimate:      BLDG 2943      Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    *****      City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205542200	SITE DEMOLITION, PAVEMENT, CONCRETE, TO 24"THICK, REINFORCED					10.00 C.Y.	
Unit values	4.21	0.00	92.52	133.64	0.00		226.16
Totals	42.11	\$0	\$925	\$1,336	\$0		\$2,261
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4"DIAMETER					500.00 L.F.	
Unit values	0.15	0.00	3.16	1.29	0.00		4.44
Totals	75.00	\$0	\$1,578	\$643	\$0		\$2,221
0207180380	HVAC DEMO, BOILER GAS/OIL STL >150MBH					1.00 Ea.	
Unit values	12.00	0.00	323.82	0.00	0.00		323.82
Totals	12.00	\$0	\$324	\$0	\$0		\$324
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					1.00 Ton	
Unit values	14.55	0.00	380.36	0.00	0.00		380.36
Totals	14.55	\$0	\$380	\$0	\$0		\$380
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					300.00 L.F.	
Unit values	0.07	0.00	1.97	0.24	0.00		2.21
Totals	21.30	\$0	\$592	\$71	\$0		\$663
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					100.00 Ea.	
Unit values	0.20	0.00	5.55	0.68	0.00		6.23
Totals	20.00	\$0	\$555	\$68	\$0		\$623
0222541900	TAMPING TRENCH B'FILL, VIBRATING PLATE, ADD					10.00 C.Y.	
Unit values	0.09	0.00	1.74	0.67	0.00		2.41
Totals	0.89	\$0	\$17	\$7	\$0		\$24
0222582800	TRENCH EXCVTNG 40HP CHNTRNCHR&BKFL 12"W24"D					130.00 L.F.	
Unit values	0.01	0.00	0.24	0.24	0.00		0.47
Totals	1.30	\$0	\$31	\$31	\$0		\$62
0251200400	CONCRETE PAVING, JOINTS/FINISH, 4500 PSI CONCRETE, 12" THICK					14.50 S.Y.	

Unit values	0.05	17.52	1.07	1.02	0.00	19.61
Totals	0.71	\$254	\$16	\$15	\$0	\$285
0260120200	BEDDING, FOR PIPE IN TRENCH SAND, DEAD OR BANK					2.50 C.Y.
Unit values	0.16	2.43	3.37	1.37	0.00	7.17
Totals	0.40	\$6	\$8	\$3	\$0	\$17
0260120500	BEDDING, PLACING IN TRENCH					2.50 C.Y.
Unit values	0.09	0.00	1.74	0.67	0.00	2.41
Totals	0.22	\$0	\$4	\$2	\$0	\$6
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.
Unit values	1.56	259.60	35.47	5.91	0.00	300.98
Totals	1.56	\$260	\$35	\$6	\$0	\$301
0268520200	GAS SERVICE & DISTRIB PIPING, POLYETHYLENE, 60- PSI 2" DIAM COIL SDR 11					130.00 L.F.
Unit values	0.07	0.75	1.48	0.00	0.00	2.23
Totals	8.71	\$98	\$192	\$0	\$0	\$290
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1"DIAM					50.00 L.F.
Unit values	0.11	1.92	2.96	0.17	0.00	5.06
Totals	5.35	\$96	\$148	\$9	\$0	\$253

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
U02 SITEWORK		205	\$714	\$4,805	\$2,191	\$0	\$7,710
1554510245	HTG INFA-RD UNT GAS ELEC IGN (See Attached for Breakdown)						
	1.00 LS						
Unit values		8.00	760.00	163.40	0.00	35046.00	35969.40
Totals		8.00	\$760	\$163	\$0	\$35,046	\$35,969
1562600137	GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM						
	TYPE 1-1/4" PIPE SIZE					1.00 Ea.	
Unit values		0.53	226.00	12.10	0.00	0.00	238.10
Totals		0.53	\$226	\$12	\$0	\$0	\$238
1562600138	GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM						
	TYPE 1-1/2" PIPE SIZE					(qty) Ea.	
Unit values		0.62	420.00	13.94	0.00	0.00	433.94
Totals		0.00	\$0	\$0	\$0	\$0	\$0
1562600139	GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM						
	TYPE 2" PIPE SIZE					1.00 Ea.	
Unit values		0.73	420.00	16.42	0.00	0.00	436.42
Totals		0.73	\$420	\$16	\$0	\$0	\$436
U15 MECHANICAL		10	\$1,406	\$191	\$0	\$35,046	\$36,643

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
ESTIMATE TOTAL		215	\$2,120	\$4,996	\$2,191	\$35,046	\$44,353
SALES TAX	0.00%		\$0				
MATL MARKUP	0.00%		\$0				
LABOR MARKUP	0.00%			\$0			
EQUIPT MARKUP	0.00%				\$0		
SUB MARKUP	0.00%					\$0	
TOTAL BEFORE CONTINGENC			\$2,120	\$4,996	\$2,191	\$35,046	\$44,353
CONTINGENCY	10.00%						\$4,435
BOND	0.00%						\$0
PROFIT	10.00%						\$4,435
JOB TOTAL							\$53,224

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
ESTIMATE TOTAL		215	\$2,120	\$4,996	\$2,191	\$35,046	\$44,353
SALES TAX	0.00%		\$0				
MATL MARKUP	0.00%		\$0				
LABOR MARKUP	0.00%			\$0			
EQUIPT MARKUP	0.00%				\$0		
SUB MARKUP	0.00%					\$0	
TOTAL BEFORE CONTINGENC			\$2,120	\$4,996	\$2,191	\$35,046	\$44,353
CONTINGENCY	10.00%						\$4,435
BOND	0.00%						\$0
PROFIT	10.00%						\$4,435
JOB TOTAL							\$53,224

```

=====
Estimate:      BLDG 2943          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   *****          City indx:Louisville, KY
=====

```

## SUMMARY

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-----
              Manhours   Matl      Labor   Equipment   Sub      Total
=====
U02 SITEWORK      205      $714    $4,805    $2,191      $0      $7,710
U15 MECHANICAL    10      $1,406    $191      $0      $35,046    $36,643
TOTAL              215      $2,120    $4,996    $2,191    $35,046    $44,353

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC $2,120    $4,996    $2,191    $35,046    $44,353
CONTINGENCY        10.00%      $4,435
BOND               0.00%      $0
PROFIT            10.00%      $4,435

JOB TOTAL                                $53,224

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=====
Estimate:      BLDG 2943          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					370.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		55.13	\$820	\$1,692	\$0	\$0	\$2,512
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION; INCL CONDUIT, WIRE, AND RECEPTACLES					200.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		29.80	\$443	\$914	\$0	\$0	\$1,357
A09 ELECTRICAL		85	\$1,263	\$2,606	\$0	\$0	\$3,869

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS 370.00 L.F.						
Unit values	0.44	4.17	10.30	0.00	0.00	14.47	
Totals	164.28	\$1,543	\$3,812	\$0	\$0	\$5,355	
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNGR SZD FOR CVRG 10' OC 1/2" DIAM 570.00 L.F.						
Unit values	0.13	1.64	2.88	0.00	0.00	4.52	
Totals	72.39	\$935	\$1,639	\$0	\$0	\$2,574	
1519010320	ALUMINUM REFLECTORS W/HANGERS 56.00 Ea.						
Unit values	0.50	39.79	3.80	0.00	0.00	43.59	
Totals	28.00	\$2,228	\$213	\$0	\$0	\$2,441	
1524105040	VACUUM PUMP AND VENT PIPING 2.00 Ea.						
Unit values	3.00	738.35	120.15	0.00	0.00	858.50	
Totals	6.00	\$1,477	\$240	\$0	\$0	\$1,717	
1552301020	GAS FIRED BURNER 100 MBH & COMBUSTION CHAMBER 6.00 Ea.						
Unit values	1.00	860.00	44.06	0.00	0.00	904.06	
Totals	6.00	\$5,160	\$264	\$0	\$0	\$5,424	
1554510160	CO RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 40MBH 10.00 Ea.						
Unit values	4.00	935.00	81.70	0.00	0.00	1016.70	
Totals	40.00	\$9,350	\$817	\$0	\$0	\$10,167	
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE 10.00 Ea.						
Unit values	1.60	70.00	76.50	0.00	0.00	146.50	
Totals	16.00	\$700	\$765	\$0	\$0	\$1,465	
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING 12.00 Ea.						
Unit values	1.00	75.00	27.55	0.00	0.00	102.55	
Totals	12.00	\$900	\$331	\$0	\$0	\$1,231	
U15 MECHANICAL		345	\$22,293	\$8,081	\$0	\$0	\$30,374

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=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====

1631200100  HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58      0.00      2.00 Ea.
Totals           5.93    $662      $141      $0      0.00    401.34
                                           $0      $803

U16 ELECTRICAL      6      $662      $141      $0      $0      $803
```

```
=====
Line #      Description
-----
            Manhours   Matl     Labor   Equipment   Sub     Total
=====
```

ESTIMATE TOTAL	436	\$24,218	\$10,828	\$0	\$0	\$35,046
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$24,218	\$10,828	\$0	\$0	\$35,046
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$35,046

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=====
Estimate:      BLDG 2943      Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY   Job #:      94013.02
Sq. footage:   City indx:Louisville, KY
=====

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## SUMMARY

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=====
              Manhours   Matl      Labor    Equipment    Sub      Total
=====
A09 ELECTRICAL      85      $1,263      $2,606          $0          $0      $3,869
U15 MECHANICAL     345      $22,293      $8,081          $0          $0      $30,374
U16 ELECTRICAL       6        $662        $141          $0          $0        $803

TOTAL              436      $24,218      $10,828          $0          $0      $35,046

SALES TAX           0.00%          $0
MATL MARKUP         0.00%          $0
LABOR MARKUP        0.00%          $0
EQUIPT MARKUP       0.00%          $0
SUB MARKUP          0.00%          $0

TOTAL BEFORE CONTINGENC $24,218      $10,828          $0          $0      $35,046
CONTINGENCY         0.00%
BOND                0.00%
PROFIT              0.00%

JOB TOTAL                                          $35,046
=====

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=====
Estimate:      BLDG 2944      Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP (GLASS
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    *****      City indx: Louisville, KY
=====

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Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205542200	SITE DEMOLITION, PAVEMENT, CONCRETE, TO 24" THICK, REINFORCED					10.00 C.Y.	
Unit values		4.21	0.00	92.52	133.64	0.00	226.16
Totals		42.11	\$0	\$925	\$1,336	\$0	\$2,261
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					500.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		75.00	\$0	\$1,578	\$643	\$0	\$2,221
0207180380	HVAC DEMO, BOILER GAS/OIL STL >150MBH					1.00 Ea.	
Unit values		12.00	0.00	323.82	0.00	0.00	323.82
Totals		12.00	\$0	\$324	\$0	\$0	\$324
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					2.00 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		29.09	\$0	\$761	\$0	\$0	\$761
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					400.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		28.40	\$0	\$790	\$95	\$0	\$885
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					150.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		30.00	\$0	\$833	\$102	\$0	\$935
0222541900	TAMPING TRENCH B'FILL, VIBRATING PLATE, ADD					10.00 C.Y.	
Unit values		0.09	0.00	1.74	0.67	0.00	2.41
Totals		0.89	\$0	\$17	\$7	\$0	\$24
0222582800	TRENCH EXCVTNG 40HP CHNTRNCHR&BKFL 12"W24"D					130.00 L.F.	
Unit values		0.01	0.00	0.24	0.24	0.00	0.47
Totals		1.30	\$0	\$31	\$31	\$0	\$62
0251200400	CONCRETE PAVING, JOINTS/FINISH, 4500 PSI CONCRETE, 12" THICK					14.50 S.Y.	

Unit values	0.05	17.52	1.07	1.02	0.00	19.61
Totals	0.71	\$254	\$16	\$15	\$0	\$285
0260120200	BEDDING, FOR PIPE IN TRENCH SAND, DEAD OR BANK					2.50 C.Y.
Unit values	0.16	2.43	3.37	1.37	0.00	7.17
Totals	0.40	\$6	\$8	\$3	\$0	\$17
0260120500	BEDDING, PLACING IN TRENCH					2.50 C.Y.
Unit values	0.09	0.00	1.74	0.67	0.00	2.41
Totals	0.22	\$0	\$4	\$2	\$0	\$6
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.
Unit values	1.56	259.60	35.47	5.91	0.00	300.98
Totals	1.56	\$260	\$35	\$6	\$0	\$301
0268520200	GAS SERVICE & DISTRIB PIPING, POLYETHYLENE, 60-PSI 2" DIAM COIL SDR 11					130.00 L.F.
Unit values	0.07	0.75	1.48	0.00	0.00	2.23
Totals	8.71	\$98	\$192	\$0	\$0	\$290
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1"DIAM					50.00 L.F.
Unit values	0.11	1.92	2.96	0.17	0.00	5.06
Totals	5.35	\$96	\$148	\$9	\$0	\$253

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
U02 SITEWORK		236	\$714	\$5,662	\$2,249	\$0	\$8,625
1554510245	HTG INFA-RD UNT GAS ELEC IGN (See Attached for Breakdown)					1.00 LS	
Unit values		0.00	0.00	0.00	0.00	57145.00	57145.00
Totals		0.00	\$0	\$0	\$0	\$57,145	\$57,145
1562600137	GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM TYPE 1-1/4" PIPE SIZE					1.00 Ea.	
Unit values		0.53	226.00	12.10	0.00	0.00	238.10
Totals		0.53	\$226	\$12	\$0	\$0	\$238
1562600139	GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM TYPE 2" PIPE SIZE					1.00 Ea.	
Unit values		0.73	420.00	16.42	0.00	0.00	436.42
Totals		0.73	\$420	\$16	\$0	\$0	\$436
U15 MECHANICAL		2	\$646	\$28	\$0	\$57,145	\$57,819

17-Oct-94

## MeansData for Lotus

Page 4

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=====
Line #      . Description
-----
              Manhours   Matl      Labor   Equipment   Sub      Total
=====
```

ESTIMATE TOTAL	238	\$1,360	\$5,690	\$2,249	\$57,145	\$66,444
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$1,360	\$5,690	\$2,249	\$57,145	\$66,444
CONTINGENCY	10.00%					\$6,644
BOND	0.00%					\$0
PROFIT	10.00%					\$6,644
JOB TOTAL						\$79,733

```

=====
Estimate:      BLDG 2944          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   *****          City indx:Louisville, KY
=====

```

## SUMMARY

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=====
              Manhours   Matl      Labor   Equipment   Sub   Total
=====
U02 SITEWORK      236      $714    $5,662    $2,249      $0    $8,625
U15 MECHANICAL      2      $646      $28      $0    $57,145    $57,819
TOTAL              238    $1,360    $5,690    $2,249    $57,145    $66,444

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC $1,360    $5,690    $2,249    $57,145    $66,444
CONTINGENCY        10.00%      $6,644
BOND               0.00%      $0
PROFIT            10.00%      $6,644
JOB TOTAL                                $79,733
=====

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=====
Estimate:      BLDG 2944          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					925.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		137.83	\$2,049	\$4,230	\$0	\$0	\$6,279
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					100.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		14.90	\$222	\$457	\$0	\$0	\$679
A09 ELECTRICAL		153	\$2,271	\$4,687	\$0	\$0	\$6,958

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					925.00 L.F.	
Unit values	0.44	4.17	10.30	0.00	0.00		14.47
Totals	410.70	\$3,857	\$9,530	\$0	\$0		\$13,387
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNGR SZD FOR CVRG 10' OC 1/2" DIAM					1025.00 L.F.	
Unit values	0.13	1.64	2.88	0.00	0.00		4.52
Totals	130.18	\$1,681	\$2,947	\$0	\$0		\$4,628
1519010320	ALUMINUM REFLECTORS W/HANGERS					136.00 Ea.	
Unit values	0.50	39.79	3.80	0.00	0.00		43.59
Totals	68.00	\$5,411	\$517	\$0	\$0		\$5,928
1524105040	VACUUM PUMP AND VENT PIPING					4.00 Ea.	
Unit values	3.00	738.35	120.15	0.00	0.00		858.50
Totals	12.00	\$2,953	\$481	\$0	\$0		\$3,434
1552301020	GAS FIRED BURNER 100 MBH & COMBUSTION CHAMBER					16.00 Ea.	
Unit values	1.00	860.00	44.06	0.00	0.00		904.06
Totals	16.00	\$13,760	\$705	\$0	\$0		\$14,465
1554510160	CO RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 40MBH					5.00 Ea.	
Unit values	4.00	935.00	81.70	0.00	0.00		1016.70
Totals	20.00	\$4,675	\$409	\$0	\$0		\$5,084
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					5.00 Ea.	
Unit values	1.60	70.00	76.50	0.00	0.00		146.50
Totals	8.00	\$350	\$382	\$0	\$0		\$732
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					9.00 Ea.	
Unit values	1.00	75.00	27.55	0.00	0.00		102.55
Totals	9.00	\$675	\$248	\$0	\$0		\$923
U15 MECHANICAL		674	\$33,362	\$15,219	\$0	\$0	\$48,581

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

1631200100      HEATING SYSTEM POWER / CONTROL PANEL

					4.00 Ea.	
Unit values	2.96	330.76	70.58	0.00	0.00	401.34
Totals	11.85	\$1,323	\$282	\$0	\$0	\$1,605

U16 ELECTRICAL	12	\$1,323	\$282	\$0	\$0	\$1,605
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```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====

ESTIMATE TOTAL      839    $36,956    $20,188          $0          $0    $57,144

SALES TAX            0.00%          $0
MATL MARKUP          0.00%          $0
LABOR MARKUP         0.00%          $0
EQUIPT MARKUP        0.00%          $0
SUB MARKUP           0.00%          $0

TOTAL BEFORE CONTINGENC  $36,956    $20,188          $0          $0    $57,144
CONTINGENCY          0.00%          $0
BOND                 0.00%          $0
PROFIT               0.00%          $0

JOB TOTAL                                $57,144
=====
```

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=====
Estimate:      BLDG 2944          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP (GLASS Bid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    City indx: Louisville, KY
=====

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## SUMMARY

```

=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
A09 ELECTRICAL  153    $2,271    $4,687          $0    $0    $6,958
U15 MECHANICAL  674    $33,362   $15,219          $0    $0   $48,581
U16 ELECTRICAL   12    $1,323     $282          $0    $0    $1,605
TOTAL          839    $36,956   $20,188          $0    $0   $57,144

SALES TAX      0.00%          $0
MATL MARKUP    0.00%          $0
LABOR MARKUP   0.00%          $0
EQUIPT MARKUP  0.00%          $0
SUB MARKUP     0.00%          $0

TOTAL BEFORE CONTINGENC  $36,956   $20,188          $0    $0   $57,144
CONTINGENCY      0.00%          $0
BOND             0.00%          $0
PROFIT           0.00%          $0

JOB TOTAL                                     $57,144
=====

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# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 1 OF 3

BUILDING NUMBER: 2942 BUILDING HEATING TEMPERATURE SETPOINT: 66 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 65 F

INFILTRATION LOSSES = 1 AIR CHGS X 388428 VOL (CU FT) X 65 F TEMP DIFF X 0.019 = 0.48 MBTU / HR  
FLOOR LOSSES = 580 LINEAR FEET OF PERIMETER X 65 F TEMP DIFF X 0.81 = 0.03 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	17220	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.12	MBTU / HR
FACE BRICK/BLK WALL =	3895	AREA (SF) X	0.14	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
8" CINDER BLOCK WALL =		AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
CORR MTL PNL WALL =	11832	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.13	MBTU / HR
CLR SGL PANE WINDOWS =	62	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL VERT LFT DOORS =	2048	AREA (SF) X	0.2	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.03	MBTU / HR
MTL OVERHEAD DOORS =	896	AREA (SF) X	0.2	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
WOOD GLAZED O'HEAD DR =		AREA (SF) X	0.583	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=	150	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
MTL/ GLAZED PERSONNEL=		AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

TOTAL BASELINE HEAT LOSSES  
= 0.84 MBTU / HR  
= 889.02 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 2942 BUILDING HEATING TEMPERATURE SETPOINT: 55 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 54 F

INFILTRATION LOSSES = 1 AIR CHGS X 388428 VOL (CU FT) X 54 F TEMP DIFF X 0.019 = 0.40 MBTU / HR  
FLOOR LOSSES = 580 LINEAR FEET OF PERIMETER X 54 F TEMP DIFF X 0.81 = 0.03 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	17220	AREA (SF) X	0.105	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.10	MBTU / HR
FACE BRICK/BLK WALL =	3895	AREA (SF) X	0.14	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.03	MBTU / HR
8" CINDER BLOCK WALL =	0	AREA (SF) X	0.389	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
CORR MTL PNL WALL =	11832	AREA (SF) X	0.17	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.11	MBTU / HR
CLR SGL PANE WINDOWS =	62	AREA (SF) X	1.235	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =	2048	AREA (SF) X	0.2	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.02	MBTU / HR
MTL OVERHEAD DOORS =	896	AREA (SF) X	0.2	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
WOOD GLAZED O'HEAD DR =	0	AREA (SF) X	0.583	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG WOOD SLIDING DOOR =	0	AREA (SF) X	0.56	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=	150	AREA (SF) X	0.56	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL=	0	AREA (SF) X	0.615	U VALUE (BTU/HR-SF-F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL ECO HEAT LOSSES

= 0.70 MBTU / HR  
= 738.57 MJ/HR

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	BASELINE	ECO - 1
SYSTEM EFFICIENCY	60%	90%
OUTSIDE DESIGN TEMP (F)	1	1
HTG TEMP SETPOINT (F)	66	55
HEATING DEGREE DAYS	4616	3396
TOTAL HEAT LOSSES (MBTU / HR)	0.84	0.70
\$ /MBTU -FUEL OIL	\$6.60	\$6.60
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62
\$ /MBTU -PPG	\$10.84	\$10.84

BUILDING NUMBER	2942	GLOSSARY OF TERMS
		1 MBTU = 1055 MJ
		0.019=CONSTANT
		.81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE
		CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS
		65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.84	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	2,393.70	MBTU/YR
	0.6	SYS EFF	X	65	TEMP DIFFERENCE						
	2,393.70	MBTU/YR		X	CORR FACTOR		1		=		
ECO - 1 =	0.70	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	1,174.03	MBTU/YR
	0.9	SYS EFF	X	54	TEMP DIFFERENCE						
	1,174.03	MBTU/YR		X	CORR FACTOR		1		=	1,174.03	MBTU/YR
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS											
									=	1,219.67	MBTU/YR
									=	1,286,748.14	MJ/YR

# ANNUAL HEATING ENERGY COST

BASELINE =	2,393.70	MBTU / YR X	6.6	\$ /MBTU	=	15,798.41	\$ /YR
ECO - 1 =	1,174.03	MBTU / YR X	4.62	\$ /MBTU	=	5,424.03	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS =							10,374.38 \$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 1 OF 3

BUILDING NUMBER: 2943 BUILDING HEATING TEMPERATURE SETPOINT: 66 F  
 OUTSIDE DESIGN TEMPERATURE 1 F  
 TEMPERATURE DIFFERENCE 65 F

INFILTRATION LOSSES = 1 AIR CHGS X 388428 VOL (CU FT) X 65 F TEMP DIFF X 0.019 = 0.48 MBTU / HR  
 FLOOR LOSSES = 580 LINEAR FEET OF PERIMETER X 65 F TEMP DIFF X 0.81 = 0.03 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	17220	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.12	MBTU / HR
FACE BRICK/BLK WALL =	3895	AREA (SF) X	0.14	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
8" CINDER BLOCK WALL =		AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
CORR MTL PNL WALL =	11832	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.13	MBTU / HR
CLR SGL PANE WINDOWS =	62	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL VERT LFT DOORS =	2048	AREA (SF) X	0.2	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.03	MBTU / HR
MTL OVERHEAD DOORS =	896	AREA (SF) X	0.2	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
WOOD GLAZED O'HEAD DR =		AREA (SF) X	0.583	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=	150	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
MTL/ GLAZED PERSONNEL=		AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL BASELINE HEAT LOSSES

= 0.84 MBTU / HR  
 = 889.02 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 2943		BUILDING HEATING TEMPERATURE SETPOINT: 55 F					PAGE 2 OF 3			
		OUTSIDE DESIGN TEMPERATURE 1 F								
		TEMPERATURE DIFFERENCE 54 F								
INFILTRATION LOSSES =		1	AIR CHGS	X	388428	VOL (CU FT)	X 54 F TEMP DIFF	X 0.019	= 0.40	MBTU / HR
FLOOR LOSSES =		580	LINEAR FEET OF PERIMETER		X	54 F TEMP DIFF	X 0.81	= 0.03	MBTU / HR	
SURFACE HEAT LOSSES										
FLAT BUILT UP ROOF =		17220	AREA (SF)	X	0.105	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE	= 0.10	MBTU / HR	
FACE BRICK/BLK WALL =		3895	AREA (SF)	X	0.14	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE	= 0.03	MBTU / HR	
8" CINDER BLOCK WALL =		0	AREA (SF)	X	0.389	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR	
CORR MTL PNL WALL =		11832	AREA (SF)	X	0.17	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE	= 0.11	MBTU / HR	
CLR SGL PANE WINDOWS =		62	AREA (SF)	X	1.235	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR	
METAL ROLL UP DOORS =		2048	AREA (SF)	X	0.2	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE	= 0.02	MBTU / HR	
MTL OVERHEAD DOORS =		896	AREA (SF)	X	0.2	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE	= 0.01	MBTU / HR	
WOOD GLAZED O'HEAD DR =		0	AREA (SF)	X	0.583	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR	
LG WOOD SLIDING DOOR =		0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR	
METAL PERSONNEL DR=		150	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR	
MTL/ GLAZED PERSONNEL=		0	AREA (SF)	X	0.615	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE	= 0.00	MBTU / HR	
TOTAL ECO HEAT LOSSES										= 0.70 MBTU / HR
										= 738.57 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	BASELINE	ECO - 1
SYSTEM EFFICIENCY	60%	90%
OUTSIDE DESIGN TEMP (F)	1	1
HTG TEMP SETPOINT (F)	66	55
HEATING DEGREE DAYS	4616	3396
TOTAL HEAT LOSSES (MBTU / HR)	0.84	0.70
\$ /MBTU -FUEL OIL	\$6.60	\$6.60
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62
\$ /MBTU -PPG	\$10.84	\$10.84

BUILDING NUMBER 2943

### GLOSSARY OF TERMS

1 MBTU = 1055 MJ  
 0.019=CONSTANT  
 .81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE  
 CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS  
 65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.84	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	2,393.70	MBTU/YR
	0.6	SYS EFF	X	65	TEMP DIFFERENCE						
ECO - 1 =	2,393.70	MBTU/YR	X		CORR FACTOR		1		=	2,393.70	MBTU/YR
	0.70	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	1,174.03	MBTU/YR
	0.9	SYS EFF	X	54	TEMP DIFFERENCE						
	1,174.03	MBTU/YR	X		CORR FACTOR		1		=	1,174.03	MBTU/YR
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS =										1,219.67	MBTU/YR
										1,286,748.14	MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	2,393.70	MBTU / YR	X	6.6	\$ /MBTU	=	15,798.41	\$ /YR
ECO - 1 =	1,174.03	MBTU / YR	X	4.62	\$ /MBTU	=	5,424.03	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS =							10,374.38	\$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 1 OF 3

BUILDING NUMBER: 2944 BUILDING HEATING TEMPERATURE SETPOINT: 66 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 65 F

INFILTRATION LOSSES = 1 AIR CHGS X 687904 VOL (CU FT) X 65 F TEMP DIFF X 0.019 = 0.85 MBTU / HR

FLOOR LOSSES = 684 LINEAR FEET OF PERIMETER X 65 F TEMP DIFF X 0.81 = 0.04 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	21497	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.15	MBTU / HR
FACE BRICK/BLK WALL =	5418	AREA (SF) X	0.14	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
8" CINDER BLOCK WALL =		AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
CORR MTL PNL WALL =	15301	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.17	MBTU / HR
CLR SGL PANE WINDOWS =	63	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
METAL VERT LFT DOORS =	5120	AREA (SF) X	0.2	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.07	MBTU / HR
MTL OVERHEAD DOORS =		AREA (SF) X	0.2	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
WOOD GLAZED O'HEAD DR =		AREA (SF) X	0.583	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL=		AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	65	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL BASELINE HEAT LOSSES

= 1.32 MBTU / HR  
= 1,395.01 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 2944 BUILDING HEATING TEMPERATURE SETPOINT: 55 F  
 OUTSIDE DESIGN TEMPERATURE 1 F  
 TEMPERATURE DIFFERENCE 54 F

INFILTRATION LOSSES = 1 AIR CHGS X 687904 VOL (CU FT) X 54 F TEMP DIFF X 0.019 = 0.71 MBTU / HR  
 FLOOR LOSSES = 684 LINEAR FEET OF PERIMETER X 54 F TEMP DIFF X 0.81 = 0.03 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	21497	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.12	MBTU / HR
FACE BRICK/BLK WALL =	5418	AREA (SF) X	0.14	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
8" CINDER BLOCK WALL =	0	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
CORR MTL PNL WALL =	15301	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.14	MBTU / HR
CLR SGL PANE WINDOWS =	63	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL VERT LFT DOORS =	5120	AREA (SF) X	0.2	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
MTL OVERHEAD DOORS =	0	AREA (SF) X	0.2	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
WOOD GLAZED O'HEAD DR =	0	AREA (SF) X	0.583	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG MTL SLIDING DOOR =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL =	0	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

TOTAL ECO HEAT LOSSES = 1.10 MBTU / HR  
 = 1,158.93 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

BUILDING NUMBER 2944		GLOSSARY OF TERMS	
SYSTEM EFFICIENCY	ECO - 1	1 MBTU = 1055 MJ	
OUTSIDE DESIGN TEMP (F)	90%	0.019=CONSTANT	
HTG TEMP SETPOINT (F)	1	.81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE	
HEATING DEGREE DAYS	66	CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS	
TOTAL HEAT LOSSES	4616	65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2	
(MBTU / HR)	1.32		
\$ /MBTU -FUEL OIL	\$6.60		
\$ /MBTU -NATURAL GAS	\$4.62		
\$ /MBTU -PPG	\$10.84		

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

<b>BASELINE =</b>	1.32	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY			
	0.6	SYS EFF	X	65	TEMP DIFFERENCE				=	3,756.11	MBTU/YR
	3,756.11	MBTU/YR	X		CORR FACTOR		1		=	3,756.11	MBTU/YR
<b>ECO - 1 =</b>	1.10	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY			
	0.9	SYS EFF	X	54	TEMP DIFFERENCE				=	1,842.25	MBTU/YR
	1,842.25	MBTU/YR	X		CORR FACTOR		1		=	1,842.25	MBTU/YR
<b>ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS</b>									=	1,913.86	MBTU/YR
									=	2,019,121.94	MJ/YR

## ANNUAL HEATING ENERGY COST

<b>BASELINE =</b>	3,756.11	MBTU / YR	X	6.6	\$ /MBTU		=	24,790.34	\$ /YR
<b>ECO - 1 =</b>	1,842.25	MBTU / YR	X	4.62	\$ /MBTU		=	8,511.21	\$ /YR
<b>ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS</b>							=	16,279.13	\$ /YR

LIFE CYCLE COST ANALYSIS SUMMARY

STUDY: 6113ECO1  
LCCID 1.080

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

INSTALLATION & LOCATION: FORT KNOX      REGION NOS. 4      CENSUS: 3

PROJECT NO. & TITLE: 6113ECO1      ECO-1 INFRARED HEAT

FISCAL YEAR 95      DISCRETE PORTION NAME: INFRARED

ANALYSIS DATE: 10-18-94      ECONOMIC LIFE 20 YEARS      PREPARED BY: JAH

1. INVESTMENT

A. CONSTRUCTION COST	\$	457980.	
B. SIOH	\$	22899.	
C. DESIGN COST	\$	22899.	
D. TOTAL COST (1A+1B+1C)	\$	503778.	
E. SALVAGE VALUE OF EXISTING EQUIPMENT	\$	0.	
F. PUBLIC UTILITY COMPANY REBATE	\$	0.	
G. TOTAL INVESTMENT (1D - 1E - 1F)	\$		503778.

2. ENERGY SAVINGS (+) / COST (-)

DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTORS OCT 1993

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ .00	0.	\$ 0.	15.61	\$ 0.
B. DIST	\$ 6.60	14811.	\$ 97756.	17.56	\$ 1716591.
C. RESID	\$ .00	0.	\$ 0.	19.97	\$ 0.
D. NAT G	\$ 4.62	-7265.	\$ -33562.	20.96	\$ -703465.
E. COAL	\$ .00	0.	\$ 0.	17.58	\$ 0.
F. LPG	\$ .00	0.	\$ 0.	16.12	\$ 0.
M. DEMAND SAVINGS			\$ 0.	14.74	\$ 0.
N. TOTAL		7547.	\$ 64194.		\$ 1013126.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)

(1) DISCOUNT FACTOR (TABLE A)	14.74	\$ 3960.
(2) DISCOUNTED SAVING/COST (3A X 3A1)		\$ 58370.

B. NON RECURRING SAVINGS(+) / COSTS(-)

ITEM	SAVINGS(+) / COST(-) (1)	YR OC (2)	DISCNT FACTOR (3)	DISCOUNTED SAVINGS(+) / COST(-) (4)
1. REPAIR	\$ 47903.	5	.86	41197.
2. REPAIR2	\$ 47903.	15	.63	30179.
3. REPAIR3	\$ 3636.	7	.81	2945.
4. REPAIR4	\$ 3636.	14	.65	2364.
5. ENVIR	\$ 88261.	3	.91	80318.
d. TOTAL	\$ 191341.			157003.

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) \$ 215373.

4. FIRST YEAR DOLLAR SAVINGS  $2N3+3A+(3Bd1/(YRS \text{ ECONOMIC LIFE}))$  \$ 77721.

5. SIMPLE PAYBACK PERIOD (1G/4) 6.48 YEARS

6. TOTAL NET DISCOUNTED SAVINGS (2N5+3C) \$ 1228500.

7. SAVINGS TO INVESTMENT RATIO (SIR) = (6 / 1G) = 2.44  
(IF < 1 PROJECT DOES NOT QUALIFY)

8. ADJUSTED INTERNAL RATE OF RETURN (AIRR): 7.80 %

```

=====
Estimate:      61XX AREA          Date:      06-Aug-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP (GLASS Bid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    MAIN GAS LINE      City indx: Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0222541900	TAMPING TRENCH B'FILL, VIBRATING PLATE, ADD 122.50 C.Y.						
Unit values	0.09	0.00	1.74	0.67	0.00	2.41	
Totals	10.90	\$0	\$213	\$82	\$0	\$295	
0222582800	TRENCH EXCVTNG 40HP CHNTRNCHR&BKFL 12"W24"D 1650.00 L.F.						
Unit values	0.01	0.00	0.24	0.24	0.00	0.47	
Totals	16.50	\$0	\$390	\$390	\$0	\$780	
0260120200	BEDDING, FOR PIPE IN TRENCH SAND, DEAD OR BANK 31.00 C.Y.						
Unit values	0.16	2.43	3.37	1.37	0.00	7.17	
Totals	4.96	\$75	\$105	\$42	\$0	\$222	
0260120500	BEDDING, PLACING IN TRENCH 31.00 C.Y.						
Unit values	0.09	0.00	1.74	0.67	0.00	2.41	
Totals	2.76	\$0	\$54	\$21	\$0	\$75	
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER 1.00 Ea.						
Unit values	1.56	259.60	35.47	5.91	0.00	300.98	
Totals	1.56	\$260	\$35	\$6	\$0	\$301	
0268520350	GAS SERVICE & DISTRIB PIPING POLYETHYLENE, 60P- SI 4"DIA, SDR11, CPLG@40FT 1650.00 L.F.						
Unit values	0.11	2.43	2.45	0.41	0.00	5.29	
Totals	178.20	\$4,016	\$4,037	\$678	\$0	\$8,731	
U02 SITEWORK		215	\$4,351	\$4,834	\$1,219	\$0	\$10,404



```
=====
Line #      Description
-----
           Manhours   Matl      Labor   Equipment   Sub      Total
=====
```

ESTIMATE TOTAL	217	\$5,801	\$4,875	\$1,219	\$0	\$11,895
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$5,801	\$4,875	\$1,219	\$0	\$11,895
CONTINGENCY	10.00%					\$1,190
BOND	0.00%					\$0
PROFIT	10.00%					\$1,190
JOB TOTAL						\$14,274

```

=====
Estimate:      61XX AREA          Date:      06-Aug-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   MAIN GAS LINE      City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
              Manhours   Matl     Labor   Equipment   Sub     Total
=====
U02 SITEWORK      215     $4,351   $4,834   $1,219       $0    $10,404
U15 MECHANICAL     2     $1,450     $41       $0       $0     $1,491
TOTAL             217     $5,801   $4,875   $1,219       $0    $11,895

SALES TAX          0.00%       $0
MATL MARKUP        0.00%       $0
LABOR MARKUP       0.00%       $0
EQUIPT MARKUP      0.00%       $0
SUB MARKUP         0.00%       $0

TOTAL BEFORE CONTINGENC $5,801   $4,875   $1,219       $0    $11,895
CONTINGENCY        10.00%           $1,190
BOND               0.00%           $0
PROFIT            10.00%           $1,190
JOB TOTAL                                     $14,274
=====

```

```

=====
Estimate:      611X AREA          Date:      06-Aug-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    SUBMAIN GAS LINE  City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0222541900	TAMPING TRENCH B'FILL, VIBRATING PLATE, ADD					44.00 C.Y.	
Unit values		0.09	0.00	1.74	0.67	0.00	2.41
Totals		3.92	\$0	\$76	\$29	\$0	\$105
0222582800	TRENCH EXCVTNG 40HP CHNTRNCHR&BKFL 12"W24"D					590.00 L.F.	
Unit values		0.01	0.00	0.24	0.24	0.00	0.47
Totals		5.90	\$0	\$139	\$139	\$0	\$278
0222700100	HORZ BORNG, .5"WALL, 3"DIA CASING, ROCKY SOIL					410.00 L.F.	
Unit values		0.03	15.58	0.62	0.10	10000.00	10016.30
Totals		11.89	\$6,386	\$253	\$42	\$10,000	\$16,681
0260120200	BEDDING, FOR PIPE IN TRENCH SAND, DEAD OR BANK					11.00 C.Y.	
Unit values		0.16	2.43	3.37	1.37	0.00	7.17
Totals		1.76	\$27	\$37	\$15	\$0	\$79
0260120500	BEDDING, PLACING IN TRENCH					11.00 C.Y.	
Unit values		0.09	0.00	1.74	0.67	0.00	2.41
Totals		0.98	\$0	\$19	\$7	\$0	\$26
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520200	GAS SERVICE & DISTRIB PIPING, POLYETHYLENE, 60-PSI 2" DIAM COIL SDR 11					1000.00 L.F.	
Unit values		0.07	0.75	1.48	0.00	0.00	2.23
Totals		67.00	\$753	\$1,480	\$0	\$0	\$2,233
U02 SITEWORK		93	\$7,426	\$2,039	\$238	\$10,000	\$19,703

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
1562600139  GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
              TYPE 2" PIPE SIZE              1.00 Ea.
Unit values      0.73    420.00      16.42      0.00      0.00    436.42
Totals           0.73    $420      $16      $0      $0      $436

U15 MECHANICAL      1      $420      $16      $0      $0      $436
```

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	94	\$7,846	\$2,055	\$238	\$10,000	\$20,139
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$7,846	\$2,055	\$238	\$10,000	\$20,139
CONTINGENCY	10.00%					\$2,014
BOND	0.00%					\$0
PROFIT	10.00%					\$2,014
JOB TOTAL						\$24,167

```

=====
Estimate:      611X AREA          Date:      06-Aug-94
Description:   COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY      Job #:      94013.02
Sq. footage:  SUBMAIN GAS LINE  City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
U02 SITEWORK      93    $7,426    $2,039      $238    $10,000    $19,703
U15 MECHANICAL     1      $420      $16         $0         $0         $436
TOTAL              94    $7,846    $2,055      $238    $10,000    $20,139

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC $7,846    $2,055      $238    $10,000    $20,139
CONTINGENCY        10.00%      $2,014
BOND               0.00%      $0
PROFIT            10.00%      $2,014
JOB TOTAL                                $24,167
=====

```

```

=====
Estimate:      BLDG 6113          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    6900.00          City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					320.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		48.00	\$0	\$1,010	\$411	\$0	\$1,421
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.75 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		10.91	\$0	\$285	\$0	\$0	\$285
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					170.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		12.07	\$0	\$336	\$40	\$0	\$376
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					50.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		10.00	\$0	\$278	\$34	\$0	\$312
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		88	\$356	\$2,092	\$500	\$0	\$2,948



```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	97	\$1,342	\$2,267	\$500	\$21,687	\$25,796
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$1,342	\$2,267	\$500	\$21,687	\$25,796
CONTINGENCY	10.00%					\$2,580
BOND	0.00%					\$0
PROFIT	10.00%					\$2,580
JOB TOTAL						\$30,955

```

=====
Estimate:      BLDG 6113          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   6900.00           City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
              Manhours   Matl      Labor   Equipment   Sub      Total
=====
U02 SITEWORK      88      $356    $2,092    $500        $0      $2,948
U15 MECHANICAL     9      $986    $175      $0      $21,687    $22,848
TOTAL             97     $1,342    $2,267    $500      $21,687    $25,796

SALES TAX         0.00%      $0
MATL MARKUP       0.00%      $0
LABOR MARKUP      0.00%      $0
EQUIPT MARKUP     0.00%      $0
SUB MARKUP        0.00%      $0

TOTAL BEFORE CONTINGENC $1,342    $2,267    $500      $21,687    $25,796
CONTINGENCY       10.00%      $2,580
BOND              0.00%      $0
PROFIT            10.00%      $2,580
JOB TOTAL                                     $30,955
=====

```

```

=====
Estimate:      BLDG 6113          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					230.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		34.27	\$510	\$1,052	\$0	\$0	\$1,562
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					120.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		17.88	\$266	\$549	\$0	\$0	\$815
A09 ELECTRICAL		53	\$776	\$1,601	\$0	\$0	\$2,377

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					220.00 L.F.	
Unit values	0.44	4.17	10.30	0.00	0.00		14.47
Totals	97.68	\$917	\$2,267	\$0	\$0		\$3,184
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNCR SZD FOR CVRG 10' OC 1/2" DIAM					340.00 L.F.	
Unit values	0.13	1.64	2.88	0.00	0.00		4.52
Totals	43.18	\$558	\$978	\$0	\$0		\$1,536
1519010320	ALUMINUM REFLECTORS W/HANGERS					29.00 Ea.	
Unit values	0.50	39.79	3.80	0.00	0.00		43.59
Totals	14.50	\$1,154	\$110	\$0	\$0		\$1,264
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.	
Unit values	3.00	738.35	120.15	0.00	0.00		858.50
Totals	3.00	\$738	\$120	\$0	\$0		\$858
1552301020	CRV-90 GAS FIRED BURNER, 90 MBH & COMBUSTION CHAMBER					6.00 Ea.	
Unit values	1.00	860.00	44.06	0.00	0.00		904.06
Totals	6.00	\$5,160	\$264	\$0	\$0		\$5,424
1554510160	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 100MBH					1.00 Ea.	
Unit values	6.00	1065.00	163.40	0.00	0.00		1228.40
Totals	6.00	\$1,065	\$163	\$0	\$0		\$1,228
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH					4.00 Ea.	
Unit values	4.00	935.00	81.70	0.00	0.00		1016.70
Totals	16.00	\$3,740	\$327	\$0	\$0		\$4,067
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					5.00 Ea.	
Unit values	1.60	70.00	76.50	0.00	0.00		146.50
Totals	8.00	\$350	\$382	\$0	\$0		\$732
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					6.00 Ea.	
Unit values	1.00	75.00	27.55	0.00	0.00		102.55
Totals	6.00	\$450	\$165	\$0	\$0		\$615

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
U15 MECHANICAL      201    $14,132    $4,776        $0        $0    $18,908
1631200100    HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58    0.00    1.00 Ea.    401.34
Totals           2.96    $331      $71      $0      $0        $402

U16 ELECTRICAL      3      $331      $71      $0      $0        $402
=====
```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
ESTIMATE TOTAL		257	\$15,239	\$6,448	\$0	\$0	\$21,687
SALES TAX	0.00%		\$0				
MATL MARKUP	0.00%		\$0				
LABOR MARKUP	0.00%			\$0			
EQUIPT MARKUP	0.00%				\$0		
SUB MARKUP	0.00%					\$0	
TOTAL BEFORE CONTINGENC			\$15,239	\$6,448	\$0	\$0	\$21,687
CONTINGENCY	0.00%						\$0
BOND	0.00%						\$0
PROFIT	0.00%						\$0
JOB TOTAL							\$21,687

```

=====
Estimate:      BLDG 6113      Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:       LIMITED EEAP (GLASS Bid Date:
Location:      FORT KNOX, KY   Job #:      94013.02
Sq. footage:   City indx: Louisville, KY
=====

```

## SUMMARY

```

=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
A09 ELECTRICAL      53      $776      $1,601      $0      $0      $2,377
U15 MECHANICAL     201     $14,132     $4,776      $0      $0     $18,908
U16 ELECTRICAL       3      $331       $71      $0      $0      $402
TOTAL              257     $15,239     $6,448      $0      $0     $21,687

SALES TAX           0.00%      $0
MATL MARKUP         0.00%      $0
LABOR MARKUP        0.00%      $0
EQUIPT MARKUP       0.00%      $0
SUB MARKUP          0.00%      $0

TOTAL BEFORE CONTINGENC $15,239     $6,448      $0      $0     $21,687
CONTINGENCY          0.00%      $0
BOND                 0.00%      $0
PROFIT               0.00%      $0

JOB TOTAL                                           $21,687
=====

```

```

=====
Estimate:      BLDG 6114      Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    6900.00      City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					320.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		48.00	\$0	\$1,010	\$411	\$0	\$1,421
0207180380	HVAC DEMO, BOILER GAS/OIL STL >150MBH					1.00 Ea.	
Unit values		12.00	0.00	323.82	0.00	0.00	323.82
Totals		12.00	\$0	\$324	\$0	\$0	\$324
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.75 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		10.91	\$0	\$285	\$0	\$0	\$285
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					170.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		12.07	\$0	\$336	\$40	\$0	\$376
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					50.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		10.00	\$0	\$278	\$34	\$0	\$312
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		100	\$356	\$2,416	\$500	\$0	\$3,272

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

1554510245 . HTG INFA-RD UNT GAS ELEC IGN (See Attached for Breakdown  
1.00 LS

Unit values	8.00	760.00	163.40	0.00	21687.00	22610.40
Totals	8.00	\$760	\$163	\$0	\$21,687	\$22,610

1562600137 GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM  
TYPE 1-1/4" PIPE SIZE 1.00 Ea.

Unit values	0.53	226.00	12.10	0.00	0.00	238.10
Totals	0.53	\$226	\$12	\$0	\$0	\$238

U15 MECHANICAL 9 \$986 \$175 \$0 \$21,687 \$22,848

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	109	\$1,342	\$2,591	\$500	\$21,687	\$26,120
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$1,342	\$2,591	\$500	\$21,687	\$26,120
CONTINGENCY	10.00%					\$2,612
BOND	0.00%					\$0
PROFIT	10.00%					\$2,612
JOB TOTAL						\$31,344

```

=====
Estimate:      BLDG 6114          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY      Job #:      94013.02
Sq. footage:  6900.00          City indx: Louisville, KY
=====

```

## SUMMARY

```

=====
      Manhours   Matl      Labor   Equipment   Sub      Total
=====
U02 SITEWORK      100      $356      $2,416      $500      $0      $3,272
U15 MECHANICAL     9       $986      $175        $0      $21,687  $22,848
TOTAL             109     $1,342     $2,591     $500     $21,687  $26,120

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC  $1,342     $2,591     $500     $21,687  $26,120
CONTINGENCY         10.00%      $2,612
BOND                 0.00%      $0
PROFIT              10.00%      $2,612
JOB TOTAL                                     $31,344
=====

```

```

=====
Estimate:      BLDG 6114      Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY   Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					230.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		34.27	\$510	\$1,052	\$0	\$0	\$1,562
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					120.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		17.88	\$266	\$549	\$0	\$0	\$815
A09 ELECTRICAL		53	\$776	\$1,601	\$0	\$0	\$2,377

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					220.00 L.F.	
Unit values	0.44	4.17	10.30	0.00	0.00		14.47
Totals	97.68	\$917	\$2,267	\$0	\$0		\$3,184
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNCR SZD FOR CVRG 10'OC 1/2" DIAM					340.00 L.F.	
Unit values	0.13	1.64	2.88	0.00	0.00		4.52
Totals	43.18	\$558	\$978	\$0	\$0		\$1,536
1519010320	ALUMINUM REFLECTORS W/HANGERS					29.00 Ea.	
Unit values	0.50	39.79	3.80	0.00	0.00		43.59
Totals	14.50	\$1,154	\$110	\$0	\$0		\$1,264
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.	
Unit values	3.00	738.35	120.15	0.00	0.00		858.50
Totals	3.00	\$738	\$120	\$0	\$0		\$858
1552301020	CRV-90 GAS FIRED BURNER, 90 MBH & COMBUSTION CHAMBER					6.00 Ea.	
Unit values	1.00	860.00	44.06	0.00	0.00		904.06
Totals	6.00	\$5,160	\$264	\$0	\$0		\$5,424
1554510160	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 100MBH					1.00 Ea.	
Unit values	6.00	1065.00	163.40	0.00	0.00		1228.40
Totals	6.00	\$1,065	\$163	\$0	\$0		\$1,228
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH					4.00 Ea.	
Unit values	4.00	935.00	81.70	0.00	0.00		1016.70
Totals	16.00	\$3,740	\$327	\$0	\$0		\$4,067
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					5.00 Ea.	
Unit values	1.60	70.00	76.50	0.00	0.00		146.50
Totals	8.00	\$350	\$382	\$0	\$0		\$732
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					6.00 Ea.	
Unit values	1.00	75.00	27.55	0.00	0.00		102.55
Totals	6.00	\$450	\$165	\$0	\$0		\$615

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=====
Line #      Description
-----
            Manhours  Matl    Labor  Equipment  Sub      Total
=====
U15 MECHANICAL      201    $14,132    $4,776        $0        $0    $18,908
1631200100    HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58    0.00    1.00 Ea.    401.34
Totals           2.96    $331      $71      $0      $0      $402

U16 ELECTRICAL      3      $331      $71      $0        $0    $402
=====
```

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=====
Line #      Description
-----
      Manhours   Matl    Labor   Equipment   Sub    Total
=====
```

ESTIMATE TOTAL	257	\$15,239	\$6,448	\$0	\$0	\$21,687
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$15,239	\$6,448	\$0	\$0	\$21,687
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$21,687

```

=====
Estimate:      BLDG 6114      Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY  Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

## SUMMARY

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-----
      Manhours   Matl      Labor   Equipment   Sub      Total
=====
A09 ELECTRICAL      53      $776      $1,601      $0      $0      $2,377
U15 MECHANICAL     201     $14,132     $4,776      $0      $0     $18,908
U16 ELECTRICAL       3      $331      $71        $0      $0      $402
TOTAL              257     $15,239     $6,448      $0      $0     $21,687

SALES TAX           0.00%      $0
MATL MARKUP         0.00%      $0
LABOR MARKUP        0.00%      $0
EQUIPT MARKUP       0.00%      $0
SUB MARKUP          0.00%      $0

TOTAL BEFORE CONTINGENC $15,239     $6,448      $0      $0     $21,687
CONTINGENCY          0.00%
BOND                 0.00%
PROFIT               0.00%

JOB TOTAL                                           $21,687

```

```

=====
Estimate:      BLDG 6115          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    6900.00          City indx: Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					320.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		48.00	\$0	\$1,010	\$411	\$0	\$1,421
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.75 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		10.91	\$0	\$285	\$0	\$0	\$285
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					170.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		12.07	\$0	\$336	\$40	\$0	\$376
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					50.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		10.00	\$0	\$278	\$34	\$0	\$312
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		88	\$356	\$2,092	\$500	\$0	\$2,948

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=====
Line #      Description
-----
            Manhours  Matl    Labor  Equipment  Sub    Total
=====

1554510245  HTG INFA-RD UNT GAS ELEC IGN (See Attached for Breakdown)
                                     1.00 LS
Unit values      8.00    760.00    163.40      0.00  21687.00  22610.40
Totals           8.00    $760      $163        $0    $21,687  $22,610

1562600137  GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
            TYPE 1-1/4" PIPE SIZE
Unit values      0.53    226.00    12.10      0.00      0.00  238.10
Totals           0.53    $226      $12        $0      $0    $238

U15 MECHANICAL      9      $986      $175        $0    $21,687  $22,848

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=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	97	\$1,342	\$2,267	\$500	\$21,687	\$25,796
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$1,342	\$2,267	\$500	\$21,687	\$25,796
CONTINGENCY	10.00%					\$2,580
BOND	0.00%					\$0
PROFIT	10.00%					\$2,580
JOB TOTAL						\$30,955

```

=====
Estimate:      BLDG 6115          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    6900.00          City indx:Louisville, KY
=====

```

## SUMMARY

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=====
              Manhours   Matl      Labor    Equipment   Sub      Total
=====
U02 SITEWORK      88      $356    $2,092      $500        $0    $2,948
U15 MECHANICAL     9      $986     $175        $0    $21,687    $22,848
TOTAL             97     $1,342    $2,267      $500    $21,687    $25,796

SALES TAX          0.00%        $0
MATL MARKUP        0.00%        $0
LABOR MARKUP       0.00%        $0
EQUIPT MARKUP      0.00%        $0
SUB MARKUP         0.00%        $0

TOTAL BEFORE CONTINGENC $1,342    $2,267      $500    $21,687    $25,796
CONTINGENCY        10.00%          $2,580
BOND               0.00%          $0
PROFIT            10.00%          $2,580
JOB TOTAL                                     $30,955
=====

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=====
Estimate:      BLDG 6115          Date:      14-Oct-94
Description:   INFRARED HEATING SYSTEM COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY      Job #:      94013.02
Sq. footage:  City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					230.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		34.27	\$510	\$1,052	\$0	\$0	\$1,562
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					120.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		17.88	\$266	\$549	\$0	\$0	\$815
A09 ELECTRICAL		53	\$776	\$1,601	\$0	\$0	\$2,377

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					220.00 L.F.	
Unit values	0.44	4.17	10.30	0.00	0.00		14.47
Totals	97.68	\$917	\$2,267	\$0	\$0		\$3,184
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNGR SZD FOR CVRG 10' OC 1/2" DIAM					340.00 L.F.	
Unit values	0.13	1.64	2.88	0.00	0.00		4.52
Totals	43.18	\$558	\$978	\$0	\$0		\$1,536
1519010320	ALUMINUM REFLECTORS W/HANGERS					29.00 Ea.	
Unit values	0.50	39.79	3.80	0.00	0.00		43.59
Totals	14.50	\$1,154	\$110	\$0	\$0		\$1,264
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.	
Unit values	3.00	738.35	120.15	0.00	0.00		858.50
Totals	3.00	\$738	\$120	\$0	\$0		\$858
1552301020	CRV-90 GAS FIRED BURNER, 90 MBH & COMBUSTION CHAMBER					6.00 Ea.	
Unit values	1.00	860.00	44.06	0.00	0.00		904.06
Totals	6.00	\$5,160	\$264	\$0	\$0		\$5,424
1554510160	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 100MBH					1.00 Ea.	
Unit values	6.00	1065.00	163.40	0.00	0.00		1228.40
Totals	6.00	\$1,065	\$163	\$0	\$0		\$1,228
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH					4.00 Ea.	
Unit values	4.00	935.00	81.70	0.00	0.00		1016.70
Totals	16.00	\$3,740	\$327	\$0	\$0		\$4,067
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					5.00 Ea.	
Unit values	1.60	70.00	76.50	0.00	0.00		146.50
Totals	8.00	\$350	\$382	\$0	\$0		\$732
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					6.00 Ea.	
Unit values	1.00	75.00	27.55	0.00	0.00		102.55
Totals	6.00	\$450	\$165	\$0	\$0		\$615

```
=====
Line #      Description
-----
            Manhours  Matl    Labor  Equipment  Sub      Total
=====
U15 MECHANICAL      201    $14,132    $4,776        $0        $0    $18,908
1631200100    HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58    0.00      1.00 Ea.    401.34
Totals           2.96    $331      $71      $0        $0        $402

U16 ELECTRICAL      3      $331      $71        $0        $0        $402
=====
```

```
=====
Line #      Description
-----
      Manhours   Matl    Labor   Equipment   Sub    Total
=====
```

ESTIMATE TOTAL	257	\$15,239	\$6,448	\$0	\$0	\$21,687
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$15,239	\$6,448	\$0	\$0	\$21,687
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$21,687

```

=====
Estimate:   BLDG 6115      Date:   14-Oct-94
Description: INFRARED HEATING SYSTEM COST ESTIMATE
Project:    LIMITED EEAP(GLASSBid Date:
Location:   FORT KNOX, KY   Job #:   94013.02
Sq. footage:      City indx:Louisville, KY
=====

```

## SUMMARY

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=====
Manhours  Matl    Labor  Equipment  Sub    Total
=====
A09 ELECTRICAL    53      $776      $1,601      $0      $0      $2,377
U15 MECHANICAL   201     $14,132    $4,776      $0      $0     $18,908
U16 ELECTRICAL     3       $331       $71        $0      $0       $402
TOTAL            257     $15,239    $6,448      $0      $0     $21,687

SALES TAX         0.00%      $0
MATL MARKUP       0.00%      $0
LABOR MARKUP      0.00%      $0
EQUIPT MARKUP     0.00%      $0
SUB MARKUP        0.00%      $0

TOTAL BEFORE CONTINGENC $15,239    $6,448      $0      $0     $21,687
CONTINGENCY       0.00%      $0
BOND              0.00%      $0
PROFIT            0.00%      $0

JOB TOTAL                                           $21,687
=====

```

```

=====
Estimate:      BLDG 6116          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    6900.00           City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					320.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		48.00	\$0	\$1,010	\$411	\$0	\$1,421
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.75 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		10.91	\$0	\$285	\$0	\$0	\$285
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					170.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		12.07	\$0	\$336	\$40	\$0	\$376
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					50.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		10.00	\$0	\$278	\$34	\$0	\$312
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		88	\$356	\$2,092	\$500	\$0	\$2,948

```

=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
1554510245  HTG INFA-RD UNT GAS ELEC IGN  (See Attached for Breakdow
                                     1.00 LS
Unit values      8.00    760.00    163.40    0.00  21687.00  22610.40
Totals           8.00    $760      $163      $0    $21,687   $22,610

1562600137  GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
              TYPE 1-1/4" PIPE SIZE
Unit values      0.53    226.00    12.10    0.00    0.00    238.10
Totals           0.53    $226      $12      $0      $0      $238

U15 MECHANICAL      9      $986      $175      $0    $21,687   $22,848

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
ESTIMATE TOTAL		97	\$1,342	\$2,267	\$500	\$21,687	\$25,796
SALES TAX	0.00%		\$0				
MATL MARKUP	0.00%		\$0				
LABOR MARKUP	0.00%			\$0			
EQUIPT MARKUP	0.00%				\$0		
SUB MARKUP	0.00%					\$0	
TOTAL BEFORE CONTINGENC			\$1,342	\$2,267	\$500	\$21,687	\$25,796
CONTINGENCY	10.00%						\$2,580
BOND	0.00%						\$0
PROFIT	10.00%						\$2,580
JOB TOTAL							\$30,955

```

=====
Estimate:      BLDG 6116           Date:      14-Oct-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   6900.00           City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
U02 SITEWORK      88    $356    $2,092    $500      $0    $2,948
U15 MECHANICAL     9    $986    $175      $0    $21,687  $22,848
TOTAL             97    $1,342   $2,267    $500    $21,687  $25,796

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC  $1,342   $2,267    $500    $21,687  $25,796
CONTINGENCY         10.00%      $2,580
BOND                 0.00%      $0
PROFIT              10.00%      $2,580
JOB TOTAL                                     $30,955
=====

```

```

=====
Estimate:      BLDG 6116           Date:      14-Oct-94
Description:   INFRARED HEATING SYSTEM COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY       Job #:      94013.02
Sq. footage:  City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					230.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		34.27	\$510	\$1,052	\$0	\$0	\$1,562
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					120.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		17.88	\$266	\$549	\$0	\$0	\$815
A09 ELECTRICAL		53	\$776	\$1,601	\$0	\$0	\$2,377

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS 220.00 L.F.						
Unit values	0.44	4.17	10.30	0.00	0.00		14.47
Totals	97.68	\$917	\$2,267	\$0	\$0		\$3,184
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNGR SZD FOR CVRG 10' OC 1/2" DIAM 340.00 L.F.						
Unit values	0.13	1.64	2.88	0.00	0.00		4.52
Totals	43.18	\$558	\$978	\$0	\$0		\$1,536
1519010320	ALUMINUM REFLECTORS W/HANGERS 29.00 Ea.						
Unit values	0.50	39.79	3.80	0.00	0.00		43.59
Totals	14.50	\$1,154	\$110	\$0	\$0		\$1,264
1524105040	VACUUM PUMP AND VENT PIPING 1.00 Ea.						
Unit values	3.00	738.35	120.15	0.00	0.00		858.50
Totals	3.00	\$738	\$120	\$0	\$0		\$858
1552301020	CRV-90 GAS FIRED BURNER, 90 MBH & COMBUSTION CHAMBER 6.00 Ea.						
Unit values	1.00	860.00	44.06	0.00	0.00		904.06
Totals	6.00	\$5,160	\$264	\$0	\$0		\$5,424
1554510160	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 100MBH 1.00 Ea.						
Unit values	6.00	1065.00	163.40	0.00	0.00		1228.40
Totals	6.00	\$1,065	\$163	\$0	\$0		\$1,228
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH 4.00 Ea.						
Unit values	4.00	935.00	81.70	0.00	0.00		1016.70
Totals	16.00	\$3,740	\$327	\$0	\$0		\$4,067
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE 5.00 Ea.						
Unit values	1.60	70.00	76.50	0.00	0.00		146.50
Totals	8.00	\$350	\$382	\$0	\$0		\$732
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING 6.00 Ea.						
Unit values	1.00	75.00	27.55	0.00	0.00		102.55
Totals	6.00	\$450	\$165	\$0	\$0		\$615

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
U15 MECHANICAL      201    $14,132    $4,776        $0        $0    $18,908
1631200100    HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58    0.00    1.00 Ea.    401.34
Totals            2.96    $331      $71      $0      $0        $402

U16 ELECTRICAL      3      $331      $71        $0        $0    $402
=====
```

```
=====
Line #      Description
-----
      Manhours   Matl     Labor   Equipment   Sub     Total
=====
```

ESTIMATE TOTAL	257	\$15,239	\$6,448	\$0	\$0	\$21,687
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$15,239	\$6,448	\$0	\$0	\$21,687
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$21,687

```

=====
Estimate:      BLDG 6116           Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
              Manhours   Matl      Labor   Equipment   Sub      Total
=====
A09 ELECTRICAL      53      $776      $1,601      $0          $0      $2,377
U15 MECHANICAL     201     $14,132     $4,776      $0          $0     $18,908
U16 ELECTRICAL       3      $331      $71         $0          $0      $402
TOTAL              257     $15,239     $6,448      $0          $0     $21,687

SALES TAX           0.00%      $0
MATL MARKUP         0.00%      $0
LABOR MARKUP        0.00%      $0
EQUIPT MARKUP       0.00%      $0
SUB MARKUP          0.00%      $0

TOTAL BEFORE CONTINGENC $15,239     $6,448      $0          $0     $21,687
CONTINGENCY          0.00%
BOND                 0.00%
PROFIT               0.00%

JOB TOTAL                                           $21,687
=====

```

```

=====
Estimate:      BLDG 6117          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    6900.00          City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					320.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		48.00	\$0	\$1,010	\$411	\$0	\$1,421
0207180380	HVAC DEMO, BOILER GAS/OIL STL >150MBH					1.00 Ea.	
Unit values		12.00	0.00	323.82	0.00	0.00	323.82
Totals		12.00	\$0	\$324	\$0	\$0	\$324
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.75 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		10.91	\$0	\$285	\$0	\$0	\$285
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					170.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		12.07	\$0	\$336	\$40	\$0	\$376
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					50.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		10.00	\$0	\$278	\$34	\$0	\$312
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		100	\$356	\$2,416	\$500	\$0	\$3,272



```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	109	\$1,342	\$2,591	\$500	\$21,687	\$26,120
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$1,342	\$2,591	\$500	\$21,687	\$26,120
CONTINGENCY	10.00%					\$2,612
BOND	0.00%					\$0
PROFIT	10.00%					\$2,612
JOB TOTAL						\$31,344

```

=====
Estimate:      BLDG 6117          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   6900.00           City indx: Louisville, KY
=====

```

## SUMMARY

```

=====
              Manhours   Matl     Labor   Equipment   Sub     Total
=====
U02 SITEWORK      100      $356    $2,416      $500        $0    $3,272
U15 MECHANICAL     9       $986    $175        $0    $21,687    $22,848
TOTAL             109      $1,342   $2,591      $500    $21,687    $26,120

SALES TAX          0.00%        $0
MATL MARKUP        0.00%        $0
LABOR MARKUP       0.00%        $0
EQUIPT MARKUP      0.00%        $0
SUB MARKUP         0.00%        $0

TOTAL BEFORE CONTINGENC $1,342   $2,591   $500   $21,687    $26,120
CONTINGENCY        10.00%                $2,612
BOND               0.00%                $0
PROFIT            10.00%                $2,612
JOB TOTAL                                     $31,344
=====

```

```

=====
Estimate:      BLDG 6117          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					230.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		34.27	\$510	\$1,052	\$0	\$0	\$1,562
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					120.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		17.88	\$266	\$549	\$0	\$0	\$815
A09 ELECTRICAL		53	\$776	\$1,601	\$0	\$0	\$2,377

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					220.00 L.F.	
Unit values	0.44	4.17	10.30	0.00	0.00		14.47
Totals	97.68	\$917	\$2,267	\$0	\$0		\$3,184
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNGR SZD FOR CVRG 10' OC 1/2" DIAM					340.00 L.F.	
Unit values	0.13	1.64	2.88	0.00	0.00		4.52
Totals	43.18	\$558	\$978	\$0	\$0		\$1,536
1519010320	ALUMINUM REFLECTORS W/HANGERS					29.00 Ea.	
Unit values	0.50	39.79	3.80	0.00	0.00		43.59
Totals	14.50	\$1,154	\$110	\$0	\$0		\$1,264
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.	
Unit values	3.00	738.35	120.15	0.00	0.00		858.50
Totals	3.00	\$738	\$120	\$0	\$0		\$858
1552301020	CRV-90 GAS FIRED BURNER, 90 MBH & COMBUSTION CHAMBER					6.00 Ea.	
Unit values	1.00	860.00	44.06	0.00	0.00		904.06
Totals	6.00	\$5,160	\$264	\$0	\$0		\$5,424
1554510160	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 100MBH					1.00 Ea.	
Unit values	6.00	1065.00	163.40	0.00	0.00		1228.40
Totals	6.00	\$1,065	\$163	\$0	\$0		\$1,228
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH					4.00 Ea.	
Unit values	4.00	935.00	81.70	0.00	0.00		1016.70
Totals	16.00	\$3,740	\$327	\$0	\$0		\$4,067
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					5.00 Ea.	
Unit values	1.60	70.00	76.50	0.00	0.00		146.50
Totals	8.00	\$350	\$382	\$0	\$0		\$732
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					6.00 Ea.	
Unit values	1.00	75.00	27.55	0.00	0.00		102.55
Totals	6.00	\$450	\$165	\$0	\$0		\$615

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
U15 MECHANICAL      201    $14,132    $4,776        $0        $0    $18,908
1631200100 . HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58    0.00    1.00 Ea.
Totals            2.96    $331      $71      $0      0.00    401.34
                        $0      $0      $0      $0      $402

U16 ELECTRICAL      3      $331      $71        $0        $0    $402
=====
```

```
=====
Line #      Description
-----
      Manhours   Matl    Labor   Equipment   Sub    Total
=====
```

ESTIMATE TOTAL	257	\$15,239	\$6,448	\$0	\$0	\$21,687
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$15,239	\$6,448	\$0	\$0	\$21,687
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$21,687

```

=====
Estimate:      BLDG 6117          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
              Manhours   Matl     Labor   Equipment   Sub     Total
=====
A09 ELECTRICAL      53       $776    $1,601        $0        $0    $2,377
U15 MECHANICAL     201     $14,132   $4,776        $0        $0   $18,908
U16 ELECTRICAL       3       $331     $71          $0        $0    $402

TOTAL              257     $15,239   $6,448        $0        $0   $21,687

SALES TAX           0.00%        $0
MATL MARKUP         0.00%        $0
LABOR MARKUP        0.00%        $0
EQUIPT MARKUP       0.00%        $0
SUB MARKUP          0.00%        $0

TOTAL BEFORE CONTINGENC $15,239   $6,448        $0        $0   $21,687
CONTINGENCY          0.00%        $0
BOND                 0.00%        $0
PROFIT               0.00%        $0

JOB TOTAL                                $21,687
=====

```

```

=====
Estimate:      BLDG 6118      Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY   Job #:      94013.02
Sq. footage:    6900.00      City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					320.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		48.00	\$0	\$1,010	\$411	\$0	\$1,421
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.75 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		10.91	\$0	\$285	\$0	\$0	\$285
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					170.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		12.07	\$0	\$336	\$40	\$0	\$376
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					50.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		10.00	\$0	\$278	\$34	\$0	\$312
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		88	\$356	\$2,092	\$500	\$0	\$2,948

```
=====
Line #      Description
-----
            Manhours  Matl    Labor  Equipment  Sub      Total
=====

1554510245  HTG INFA-RD UNT GAS ELEC IGN  (See Attached for Breakdown
                                     1.00 LS
Unit values      8.00    760.00    163.40    0.00  21687.00  22610.40
Totals           8.00      $760      $163      $0    $21,687  $22,610

1562600137  GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
            TYPE 1-1/4" PIPE SIZE 1.00 Ea.
Unit values      0.53    226.00    12.10    0.00    0.00    238.10
Totals           0.53      $226      $12      $0      $0      $238

U15 MECHANICAL      9      $986      $175      $0    $21,687  $22,848
```

```
=====
Line #      Description
-----
           Manhours   Matl      Labor   Equipment   Sub      Total
=====
```

ESTIMATE TOTAL	97	\$1,342	\$2,267	\$500	\$21,687	\$25,796
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$1,342	\$2,267	\$500	\$21,687	\$25,796
CONTINGENCY	10.00%					\$2,580
BOND	0.00%					\$0
PROFIT	10.00%					\$2,580
JOB TOTAL						\$30,955

```

=====
Estimate:      BLDG 6118           Date:      14-Oct-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY       Job #:      94013.02
Sq. footage:   6900.00           City indx: Louisville, KY
=====

```

## SUMMARY

```

=====
              Manhours   Matl      Labor   Equipment   Sub      Total
=====
U02 SITEWORK      88      $356    $2,092      $500        $0    $2,948
U15 MECHANICAL     9      $986    $175        $0    $21,687    $22,848
TOTAL             97      $1,342   $2,267      $500    $21,687    $25,796

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC $1,342   $2,267      $500    $21,687    $25,796
CONTINGENCY        10.00%      $2,580
BOND               0.00%      $0
PROFIT            10.00%      $2,580
JOB TOTAL                                     $30,955
=====

```

```

=====
Estimate:      BLDG 6118           Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					230.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		34.27	\$510	\$1,052	\$0	\$0	\$1,562
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					120.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		17.88	\$266	\$549	\$0	\$0	\$815
A09 ELECTRICAL		53	\$776	\$1,601	\$0	\$0	\$2,377

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					220.00 L.F.	
Unit values	0.44	4.17	10.30	0.00	0.00		14.47
Totals	97.68	\$917	\$2,267	\$0	\$0		\$3,184
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNCR SZD FOR CVRG 10' OC 1/2" DIAM					340.00 L.F.	
Unit values	0.13	1.64	2.88	0.00	0.00		4.52
Totals	43.18	\$558	\$978	\$0	\$0		\$1,536
1519010320	ALUMINUM REFLECTORS W/HANGERS					29.00 Ea.	
Unit values	0.50	39.79	3.80	0.00	0.00		43.59
Totals	14.50	\$1,154	\$110	\$0	\$0		\$1,264
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.	
Unit values	3.00	738.35	120.15	0.00	0.00		858.50
Totals	3.00	\$738	\$120	\$0	\$0		\$858
1552301020	CRV-90 GAS FIRED BURNER, 90 MBH & COMBUSTION CHAMBER					6.00 Ea.	
Unit values	1.00	860.00	44.06	0.00	0.00		904.06
Totals	6.00	\$5,160	\$264	\$0	\$0		\$5,424
1554510160	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 100MBH					1.00 Ea.	
Unit values	6.00	1065.00	163.40	0.00	0.00		1228.40
Totals	6.00	\$1,065	\$163	\$0	\$0		\$1,228
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH					4.00 Ea.	
Unit values	4.00	935.00	81.70	0.00	0.00		1016.70
Totals	16.00	\$3,740	\$327	\$0	\$0		\$4,067
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					5.00 Ea.	
Unit values	1.60	70.00	76.50	0.00	0.00		146.50
Totals	8.00	\$350	\$382	\$0	\$0		\$732
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					6.00 Ea.	
Unit values	1.00	75.00	27.55	0.00	0.00		102.55
Totals	6.00	\$450	\$165	\$0	\$0		\$615

```
=====
Line #      Description
-----
           Manhours  Matl    Labor  Equipment  Sub    Total
=====
U15 MECHANICAL      201    $14,132    $4,776        $0        $0    $18,908
1631200100    HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58    0.00    1.00 Ea.    401.34
Totals           2.96    $331      $71      $0      $0        $402

U16 ELECTRICAL      3      $331      $71        $0        $0    $402
=====
```

```
=====
Line #      Description
-----
      Manhours   Matl    Labor   Equipment   Sub    Total
=====
```

ESTIMATE TOTAL	257	\$15,239	\$6,448	\$0	\$0	\$21,687
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$15,239	\$6,448	\$0	\$0	\$21,687
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$21,687

```

=====
Estimate:      BLDG 6118           Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:       LIMITED EEAP (GLASS Bid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   City indx: Louisville, KY
=====

```

## SUMMARY

```

-----
Manhours  Matl  Labor  Equipment  Sub  Total
=====
A09 ELECTRICAL      53      $776      $1,601      $0      $0      $2,377
U15 MECHANICAL     201     $14,132     $4,776      $0      $0     $18,908
U16 ELECTRICAL       3      $331       $71       $0      $0      $402
TOTAL              257     $15,239     $6,448      $0      $0     $21,687

SALES TAX           0.00%      $0
MATL MARKUP         0.00%      $0
LABOR MARKUP        0.00%      $0
EQUIPT MARKUP       0.00%      $0
SUB MARKUP          0.00%      $0

TOTAL BEFORE CONTINGENC $15,239     $6,448      $0      $0     $21,687
CONTINGENCY          0.00%      $0
BOND                 0.00%      $0
PROFIT               0.00%      $0

JOB TOTAL                                           $21,687

```

```

=====
Estimate:      614X AREA          Date:      06-Aug-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP (GLASS Bid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   SUBMAIN GAS LINE  City indx: Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0222541900	TAMPING TRENCH B'FILL, VIBRATING PLATE, ADD					86.00 C.Y.	
Unit values		0.09	0.00	1.74	0.67	0.00	2.41
Totals		7.65	\$0	\$149	\$57	\$0	\$206
0222582800	TRENCH EXCVTNG 40HP CHNTRNCHR&BKFL 12"W24"D					1160.00 L.F.	
Unit values		0.01	0.00	0.24	0.24	0.00	0.47
Totals		11.60	\$0	\$274	\$274	\$0	\$548
0222700100	HORZ BORNG , .5"WALL, 3"DIA CASING, ROCKY SOIL					300.00 L.F.	
Unit values		0.03	15.58	0.62	0.10	10000.00	10016.30
Totals		8.70	\$4,673	\$185	\$31	\$10,000	\$14,889
0260120200	BEDDING, FOR PIPE IN TRENCH SAND, DEAD OR BANK					21.50 C.Y.	
Unit values		0.16	2.43	3.37	1.37	0.00	7.17
Totals		3.44	\$52	\$72	\$29	\$0	\$153
0260120500	BEDDING, PLACING IN TRENCH					21.50 C.Y.	
Unit values		0.09	0.00	1.74	0.67	0.00	2.41
Totals		1.91	\$0	\$37	\$14	\$0	\$51
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520200	GAS SERVICE & DISTRIB PIPING, POLYETHYLENE, 60-PSI 2" DIAM COIL SDR 11					1460.00 L.F.	
Unit values		0.07	0.75	1.48	0.00	0.00	2.23
Totals		97.82	\$1,099	\$2,161	\$0	\$0	\$3,260
U02 SITEWORK		133	\$6,084	\$2,913	\$411	\$10,000	\$19,408

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====

1562600139  GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
              TYPE 2" PIPE SIZE
Unit values    0.73    420.00    16.42    0.00    1.00 Ea.    436.42
Totals         0.73    $420      $16      $0      $0      $436

U15 MECHANICAL      1      $420      $16      $0      $0      $436
```

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=====
Line #      Description
-----
              Manhours   Matl      Labor    Equipment   Sub      Total
=====
```

ESTIMATE TOTAL	134	\$6,504	\$2,929	\$411	\$10,000	\$19,844
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$6,504	\$2,929	\$411	\$10,000	\$19,844
CONTINGENCY	10.00%					\$1,984
BOND	0.00%					\$0
PROFIT	10.00%					\$1,984
JOB TOTAL						\$23,813

```

=====
Estimate:      614X AREA          Date:      06-Aug-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   SUBMAIN GAS LINE  City indx:Louisville, KY
=====

```

## SUMMARY

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=====
              Manhours   Matl     Labor   Equipment   Sub     Total
=====
U02 SITEWORK      133     $6,084   $2,913     $411   $10,000   $19,408
U15 MECHANICAL      1       $420     $16        $0       $0       $436
TOTAL              134     $6,504   $2,929     $411   $10,000   $19,844

SALES TAX          0.00%       $0
MATL MARKUP        0.00%       $0
LABOR MARKUP       0.00%       $0
EQUIPT MARKUP      0.00%       $0
SUB MARKUP         0.00%       $0

TOTAL BEFORE CONTINGENC $6,504   $2,929     $411   $10,000   $19,844
CONTINGENCY        10.00%       $1,984
BOND               0.00%       $0
PROFIT            10.00%       $1,984
JOB TOTAL                      $23,813
=====

```

```

=====
Estimate:      BLDG 6142          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    8100.00          City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					400.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		60.00	\$0	\$1,262	\$514	\$0	\$1,776
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.75 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		10.91	\$0	\$285	\$0	\$0	\$285
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					200.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		14.20	\$0	\$395	\$47	\$0	\$442
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					70.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		14.00	\$0	\$389	\$47	\$0	\$436
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		107	\$356	\$2,514	\$623	\$0	\$3,493

```
=====
Line #      Description
-----
           Manhours  Matl    Labor  Equipment  Sub    Total
=====

1554510245  HTG INFA-RD UNT GAS ELEC IGN  (See Attached for Breakdown)
                                     1.00 LS
Unit values      0.00      0.00      0.00      0.00 25219.00 25219.00
Totals           0.00      $0      $0      $0  $25,219  $25,219

1562600137  GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
           TYPE 1-1/4" PIPE SIZE                                     1.00 Ea.
Unit values      0.53    226.00    12.10      0.00      0.00 238.10
Totals           0.53    $226      $12      $0      $0  $238

U15 MECHANICAL      1      $226      $12      $0  $25,219  $25,457
=====
```

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment    Sub    Total
=====
```

ESTIMATE TOTAL	108	\$582	\$2,526	\$623	\$25,219	\$28,950
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$582	\$2,526	\$623	\$25,219	\$28,950
CONTINGENCY	10.00%					\$2,895
BOND	0.00%					\$0
PROFIT	10.00%					\$2,895
JOB TOTAL						\$34,740

```

=====
Estimate:      BLDG 6142          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   8100.00           City indx:Louisville, KY
=====

```

## SUMMARY

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=====
              Manhours   Matl     Labor   Equipment   Sub       Total
=====
U02 SITEWORK      107      $356    $2,514    $623        $0      $3,493
U15 MECHANICAL     1      $226     $12      $0      $25,219   $25,457
TOTAL             108      $582    $2,526    $623      $25,219   $28,950

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC $582    $2,526    $623    $25,219   $28,950
CONTINGENCY        10.00%      $2,895
BOND               0.00%      $0
PROFIT             10.00%      $2,895
JOB TOTAL                                     $34,740
=====

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=====
Estimate:      BLDG 6142          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					340.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		50.66	\$753	\$1,555	\$0	\$0	\$2,308
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					120.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		17.88	\$266	\$549	\$0	\$0	\$815
A09 ELECTRICAL		69	\$1,019	\$2,104	\$0	\$0	\$3,123

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					330.00 L.F.	
Unit values	0.44	4.17	10.30	0.00	0.00		14.47
Totals	146.52	\$1,376	\$3,400	\$0	\$0		\$4,776
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNCR SZD FOR CVRG 10' OC 1/2" DIAM					450.00 L.F.	
Unit values	0.13	1.64	2.88	0.00	0.00		4.52
Totals	57.15	\$738	\$1,294	\$0	\$0		\$2,032
1519010320	ALUMINUM REFLECTORS W/HANGERS					45.00 Ea.	
Unit values	0.50	39.79	3.80	0.00	0.00		43.59
Totals	22.50	\$1,791	\$171	\$0	\$0		\$1,962
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.	
Unit values	3.00	738.35	120.15	0.00	0.00		858.50
Totals	3.00	\$738	\$120	\$0	\$0		\$858
1552301020	CRV-100 GAS FIRED BURNER, 100 MBH & COMBUSTION CHAMBER					6.00 Ea.	
Unit values	1.00	860.00	44.06	0.00	0.00		904.06
Totals	6.00	\$5,160	\$264	\$0	\$0		\$5,424
1554510160	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 100MBH					1.00 Ea.	
Unit values	6.00	1065.00	163.40	0.00	0.00		1228.40
Totals	6.00	\$1,065	\$163	\$0	\$0		\$1,228
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH					4.00 Ea.	
Unit values	4.00	935.00	81.70	0.00	0.00		1016.70
Totals	16.00	\$3,740	\$327	\$0	\$0		\$4,067
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					5.00 Ea.	
Unit values	1.60	70.00	76.50	0.00	0.00		146.50
Totals	8.00	\$350	\$382	\$0	\$0		\$732
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					6.00 Ea.	
Unit values	1.00	75.00	27.55	0.00	0.00		102.55
Totals	6.00	\$450	\$165	\$0	\$0		\$615

```
=====
Line #      Description
-----
           Manhours   Matl     Labor   Equipment   Sub     Total
=====
U15 MECHANICAL      272    $15,408    $6,286         $0         $0    $21,694
1631200100    HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58     0.00         0.00    401.34
Totals           2.96     $331     $71         $0         $0     $402

U16 ELECTRICAL      3      $331      $71         $0         $0     $402
=====
```

```
=====
Line #      Description
-----
           Manhours   Matl     Labor   Equipment   Sub     Total
=====

ESTIMATE TOTAL      344    $16,758    $8,461         $0         $0    $25,219

SALES TAX            0.00%         $0
MATL MARKUP          0.00%         $0
LABOR MARKUP         0.00%         $0
EQUIPT MARKUP        0.00%         $0
SUB MARKUP           0.00%         $0

TOTAL BEFORE CONTINGENC  $16,758    $8,461         $0         $0    $25,219
CONTINGENCY           0.00%         $0
BOND                  0.00%         $0
PROFIT                0.00%         $0

JOB TOTAL                                     $25,219
=====
```

```

=====
Estimate:      BLDG 6142      Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:       LIMITED EEAP (GLASS Bid Date:
Location:      FORT KNOX, KY   Job #:      94013.02
Sq. footage:   City indx: Louisville, KY
=====

```

## SUMMARY

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=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
A09 ELECTRICAL      69    $1,019    $2,104          $0    $0    $3,123
U15 MECHANICAL     272   $15,408    $6,286          $0    $0   $21,694
U16 ELECTRICAL       3     $331      $71            $0    $0    $402

TOTAL              344   $16,758    $8,461          $0    $0   $25,219

SALES TAX           0.00%        $0
MATL MARKUP         0.00%        $0
LABOR MARKUP        0.00%          $0
EQUIPT MARKUP       0.00%          $0
SUB MARKUP          0.00%          $0

TOTAL BEFORE CONTINGENC $16,758    $8,461          $0    $0   $25,219
CONTINGENCY          0.00%          $0
BOND                 0.00%          $0
PROFIT               0.00%          $0

JOB TOTAL                                $25,219
=====

```

```

=====
Estimate:      BLDG 6143      Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    8100.00      City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					400.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		60.00	\$0	\$1,262	\$514	\$0	\$1,776
0207180380	HVAC DEMO, BOILER GAS/OIL STL >150MBH					1.00 Ea.	
Unit values		12.00	0.00	323.82	0.00	0.00	323.82
Totals		12.00	\$0	\$324	\$0	\$0	\$324
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.75 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		10.91	\$0	\$285	\$0	\$0	\$285
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					200.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		14.20	\$0	\$395	\$47	\$0	\$442
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					70.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		14.00	\$0	\$389	\$47	\$0	\$436
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		119	\$356	\$2,838	\$623	\$0	\$3,817

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====

1554510245  HTG INFA-RD UNT GAS ELEC IGN (See Attached for Breakdown)
                                     1.00 LS
Unit values      0.00      0.00      0.00      0.00 25219.00 25219.00
Totals           0.00      $0      $0      $0  $25,219  $25,219

1562600137  GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
TYPE 1-1/4" PIPE SIZE
Unit values      0.53    226.00    12.10      0.00      0.00 238.10
Totals           0.53    $226      $12      $0      $0  $238

U15 MECHANICAL      1      $226      $12      $0  $25,219  $25,457
```

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	120	\$582	\$2,850	\$623	\$25,219	\$29,274
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$582	\$2,850	\$623	\$25,219	\$29,274
CONTINGENCY	10.00%					\$2,927
BOND	0.00%					\$0
PROFIT	10.00%					\$2,927
JOB TOTAL						\$35,129

```

=====
Estimate:      BLDG 6143      Date:      14-Oct-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY   Job #:      94013.02
Sq. footage:   8100.00        City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
U02 SITEWORK      119    $356    $2,838    $623      $0    $3,817
U15 MECHANICAL     1    $226     $12      $0    $25,219    $25,457
TOTAL             120    $582    $2,850    $623    $25,219    $29,274

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC  $582    $2,850    $623    $25,219    $29,274
CONTINGENCY         10.00%      $2,927
BOND                0.00%      $0
PROFIT              10.00%      $2,927
JOB TOTAL                                     $35,129
=====

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=====
Estimate:      BLDG 6143           Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP (GLASS Bid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    City indx: Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					340.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		50.66	\$753	\$1,555	\$0	\$0	\$2,308
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					120.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		17.88	\$266	\$549	\$0	\$0	\$815
A09 ELECTRICAL		69	\$1,019	\$2,104	\$0	\$0	\$3,123

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					330.00 L.F.	
Unit values	0.44	4.17	10.30	0.00	0.00		14.47
Totals	146.52	\$1,376	\$3,400	\$0	\$0		\$4,776
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNCR SZD FOR CVRG 10' OC 1/2" DIAM					450.00 L.F.	
Unit values	0.13	1.64	2.88	0.00	0.00		4.52
Totals	57.15	\$738	\$1,294	\$0	\$0		\$2,032
1519010320	ALUMINUM REFLECTORS W/HANGERS					45.00 Ea.	
Unit values	0.50	39.79	3.80	0.00	0.00		43.59
Totals	22.50	\$1,791	\$171	\$0	\$0		\$1,962
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.	
Unit values	3.00	738.35	120.15	0.00	0.00		858.50
Totals	3.00	\$738	\$120	\$0	\$0		\$858
1552301020	CRV-100 GAS FIRED BURNER, 100 MBH & COMBUSTION CHAMBER					6.00 Ea.	
Unit values	1.00	860.00	44.06	0.00	0.00		904.06
Totals	6.00	\$5,160	\$264	\$0	\$0		\$5,424
1554510160	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 100MBH					1.00 Ea.	
Unit values	6.00	1065.00	163.40	0.00	0.00		1228.40
Totals	6.00	\$1,065	\$163	\$0	\$0		\$1,228
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH					4.00 Ea.	
Unit values	4.00	935.00	81.70	0.00	0.00		1016.70
Totals	16.00	\$3,740	\$327	\$0	\$0		\$4,067
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					5.00 Ea.	
Unit values	1.60	70.00	76.50	0.00	0.00		146.50
Totals	8.00	\$350	\$382	\$0	\$0		\$732
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					6.00 Ea.	
Unit values	1.00	75.00	27.55	0.00	0.00		102.55
Totals	6.00	\$450	\$165	\$0	\$0		\$615

```
=====
Line #      Description
-----
              Manhours   Matl     Labor   Equipment   Sub      Total
=====
U15 MECHANICAL      272    $15,408    $6,286         $0         $0    $21,694
1631200100    HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58     0.00      0.00    401.34
Totals           2.96     $331      $71        $0        $0     $402

U16 ELECTRICAL       3      $331      $71        $0         $0     $402
```

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====

ESTIMATE TOTAL      344    $16,758    $8,461          $0          $0    $25,219

SALES TAX            0.00%          $0
MATL MARKUP          0.00%          $0
LABOR MARKUP         0.00%          $0
EQUIPT MARKUP        0.00%          $0
SUB MARKUP           0.00%          $0

TOTAL BEFORE CONTINGENC  $16,758    $8,461          $0          $0    $25,219
CONTINGENCY           0.00%          $0
BOND                  0.00%          $0
PROFIT                0.00%          $0

JOB TOTAL                                $25,219
=====
```

```

=====
Estimate:      BLDG 6143      Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY  Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

## SUMMARY

```

-----
      Manhours   Matl      Labor   Equipment   Sub      Total
=====
A09 ELECTRICAL      69      $1,019    $2,104         $0         $0      $3,123
U15 MECHANICAL     272     $15,408    $6,286         $0         $0     $21,694
U16 ELECTRICAL       3        $331      $71           $0         $0       $402
TOTAL                344     $16,758    $8,461         $0         $0     $25,219

SALES TAX            0.00%         $0
MATL MARKUP          0.00%         $0
LABOR MARKUP         0.00%         $0
EQUIPT MARKUP        0.00%         $0
SUB MARKUP           0.00%         $0

TOTAL BEFORE CONTINGENC $16,758    $8,461         $0         $0     $25,219
CONTINGENCY           0.00%         $0
BOND                  0.00%         $0
PROFIT                0.00%         $0

JOB TOTAL                                $25,219

```

```

=====
Estimate:      BLDG 6144          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP (GLASS Bid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   8100.00           City indx: Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					400.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		60.00	\$0	\$1,262	\$514	\$0	\$1,776
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.75 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		10.91	\$0	\$285	\$0	\$0	\$285
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					200.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		14.20	\$0	\$395	\$47	\$0	\$442
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					70.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		14.00	\$0	\$389	\$47	\$0	\$436
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE & DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT & WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		107	\$356	\$2,514	\$623	\$0	\$3,493



```
=====
Line #      Description
-----
      Manhours   Matl    Labor   Equipment   Sub    Total
=====
```

ESTIMATE TOTAL	108	\$582	\$2,526	\$623	\$25,219	\$28,950
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$582	\$2,526	\$623	\$25,219	\$28,950
CONTINGENCY	10.00%					\$2,895
BOND	0.00%					\$0
PROFIT	10.00%					\$2,895
JOB TOTAL						\$34,740

```

=====
Estimate:      BLDG 6144      Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY  Job #:      94013.02
Sq. footage:    8100.00      City indx:Louisville, KY
=====

```

## SUMMARY

```

-----
              Manhours   Matl      Labor    Equipment    Sub      Total
=====
U02 SITEWORK      107      $356      $2,514      $623          $0      $3,493
U15 MECHANICAL      1      $226          $12          $0      $25,219      $25,457
TOTAL              108      $582      $2,526      $623      $25,219      $28,950

SALES TAX          0.00%          $0
MATL MARKUP        0.00%          $0
LABOR MARKUP        0.00%          $0
EQUIPT MARKUP       0.00%          $0
SUB MARKUP          0.00%          $0

TOTAL BEFORE CONTINGENC      $582      $2,526      $623      $25,219      $28,950
CONTINGENCY         10.00%          $2,895
BOND                 0.00%          $0
PROFIT              10.00%          $2,895
JOB TOTAL                                $34,740

```

```

=====
Estimate:      BLDG 6144      Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					340.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		50.66	\$753	\$1,555	\$0	\$0	\$2,308
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					120.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		17.88	\$266	\$549	\$0	\$0	\$815
A09 ELECTRICAL		69	\$1,019	\$2,104	\$0	\$0	\$3,123

=====						
Line #	Description					
	Manhours	Matl	Labor	Equipment	Sub	Total
=====						
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					
					330.00 L.F.	
Unit values	0.44	4.17	10.30	0.00	0.00	14.47
Totals	146.52	\$1,376	\$3,400	\$0	\$0	\$4,776
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNGR SZD FOR CVRG 10'OC 1/2" DIAM					
					450.00 L.F.	
Unit values	0.13	1.64	2.88	0.00	0.00	4.52
Totals	57.15	\$738	\$1,294	\$0	\$0	\$2,032
1519010320	ALUMINUM REFLECTORS W/HANGERS					
					45.00 Ea.	
Unit values	0.50	39.79	3.80	0.00	0.00	43.59
Totals	22.50	\$1,791	\$171	\$0	\$0	\$1,962
1524105040	VACUUM PUMP AND VENT PIPING					
					1.00 Ea.	
Unit values	3.00	738.35	120.15	0.00	0.00	858.50
Totals	3.00	\$738	\$120	\$0	\$0	\$858
1552301020	CRV-100 GAS FIRED BURNER, 100 MBH & COMBUSTION CHAMBER					
					6.00 Ea.	
Unit values	1.00	860.00	44.06	0.00	0.00	904.06
Totals	6.00	\$5,160	\$264	\$0	\$0	\$5,424
1554510160	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 100MBH					
					1.00 Ea.	
Unit values	6.00	1065.00	163.40	0.00	0.00	1228.40
Totals	6.00	\$1,065	\$163	\$0	\$0	\$1,228
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH					
					4.00 Ea.	
Unit values	4.00	935.00	81.70	0.00	0.00	1016.70
Totals	16.00	\$3,740	\$327	\$0	\$0	\$4,067
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					
					5.00 Ea.	
Unit values	1.60	70.00	76.50	0.00	0.00	146.50
Totals	8.00	\$350	\$382	\$0	\$0	\$732
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					
					6.00 Ea.	
Unit values	1.00	75.00	27.55	0.00	0.00	102.55
Totals	6.00	\$450	\$165	\$0	\$0	\$615

```
=====
Line #      Description
-----
              Manhours  Matl    Labor  Equipment  Sub    Total
=====
U15 MECHANICAL      272    $15,408    $6,286        $0        $0    $21,694
1631200100    HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58    0.00    1.00 Ea.    401.34
Totals            2.96    $331      $71      $0      $0      $402

U16 ELECTRICAL      3      $331      $71      $0      $0      $402
=====
```

```
=====
Line #      Description
-----
      Manhours   Matl    Labor   Equipment   Sub    Total
=====
```

ESTIMATE TOTAL	344	\$16,758	\$8,461	\$0	\$0	\$25,219
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$16,758	\$8,461	\$0	\$0	\$25,219
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$25,219

```

=====
Estimate:      BLDG 6144      Date:      14-Oct-94
Description:   INFRARED HEATING SYSTEM COST ESTIMATE
Project:       LIMITED EEAP (GLASS Bid Date:
Location:      FORT KNOX, KY   Job #:      94013.02
Sq. footage:   City indx: Louisville, KY
=====

```

## SUMMARY

```

=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
A09 ELECTRICAL      69    $1,019    $2,104        $0    $0    $3,123
U15 MECHANICAL     272   $15,408    $6,286        $0    $0   $21,694
U16 ELECTRICAL       3     $331      $71          $0    $0    $402
TOTAL              344   $16,758    $8,461        $0    $0   $25,219

SALES TAX           0.00%        $0
MATL MARKUP         0.00%        $0
LABOR MARKUP        0.00%        $0
EQUIPT MARKUP       0.00%        $0
SUB MARKUP          0.00%        $0

TOTAL BEFORE CONTINGENC $16,758    $8,461        $0    $0   $25,219
CONTINGENCY          0.00%        $0
BOND                 0.00%        $0
PROFIT               0.00%        $0

JOB TOTAL                                     $25,219
=====

```

```

=====
Estimate:      BLDG 6145      Date:      14-Oct-94
Description:   COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY   Job #:      94013.02
Sq. footage:  8100.00        City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					400.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		60.00	\$0	\$1,262	\$514	\$0	\$1,776
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.75 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		10.91	\$0	\$285	\$0	\$0	\$285
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					200.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		14.20	\$0	\$395	\$47	\$0	\$442
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					70.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		14.00	\$0	\$389	\$47	\$0	\$436
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		107	\$356	\$2,514	\$623	\$0	\$3,493

```

=====
Line #      Description
-----
            Manhours  Matl    Labor  Equipment  Sub    Total
=====

1554510245  HTG INFA-RD UNT GAS ELEC IGN  (See Attached for Breakdown)
                                     1.00 LS
Unit values      0.00      0.00      0.00      0.00 25219.00 25219.00
Totals           0.00      $0      $0      $0  $25,219  $25,219

1562600137  GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
            TYPE 1-1/4" PIPE SIZE
Unit values      0.53     226.00     12.10      0.00      0.00 238.10
Totals           0.53     $226      $12      $0      $0  $238

U15 MECHANICAL      1      $226      $12      $0  $25,219  $25,457

```

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	108	\$582	\$2,526	\$623	\$25,219	\$28,950
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$582	\$2,526	\$623	\$25,219	\$28,950
CONTINGENCY	10.00%					\$2,895
BOND	0.00%					\$0
PROFIT	10.00%					\$2,895
JOB TOTAL						\$34,740

```

=====
Estimate:      BLDG 6145      Date:      14-Oct-94
Description:   COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY   Job #:      94013.02
Sq. footage:  8100.00       City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
              Manhours   Matl      Labor    Equipment    Sub      Total
=====
U02 SITEWORK      107      $356     $2,514      $623         $0      $3,493
U15 MECHANICAL      1      $226       $12         $0      $25,219    $25,457
TOTAL              108      $582     $2,526      $623      $25,219    $28,950

SALES TAX          0.00%       $0
MATL MARKUP        0.00%       $0
LABOR MARKUP        0.00%       $0
EQUIPT MARKUP       0.00%       $0
SUB MARKUP          0.00%       $0

TOTAL BEFORE CONTINGENC      $582     $2,526      $623      $25,219    $28,950
CONTINGENCY.        10.00%                $2,895
BOND                 0.00%                $0
PROFIT              10.00%                $2,895
JOB TOTAL                                $34,740
=====

```

```

=====
Estimate:      BLDG 6145      Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					340.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		50.66	\$753	\$1,555	\$0	\$0	\$2,308
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					120.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		17.88	\$266	\$549	\$0	\$0	\$815
A09 ELECTRICAL		69	\$1,019	\$2,104	\$0	\$0	\$3,123

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					330.00 L.F.	
Unit values		0.44	4.17	10.30	0.00	0.00	14.47
Totals		146.52	\$1,376	\$3,400	\$0	\$0	\$4,776
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNCR SZD FOR CVRG 10' OC 1/2" DIAM					450.00 L.F.	
Unit values		0.13	1.64	2.88	0.00	0.00	4.52
Totals		57.15	\$738	\$1,294	\$0	\$0	\$2,032
1519010320	ALUMINUM REFLECTORS W/HANGERS					45.00 Ea.	
Unit values		0.50	39.79	3.80	0.00	0.00	43.59
Totals		22.50	\$1,791	\$171	\$0	\$0	\$1,962
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.	
Unit values		3.00	738.35	120.15	0.00	0.00	858.50
Totals		3.00	\$738	\$120	\$0	\$0	\$858
1552301020	CRV-100 GAS FIRED BURNER, 100 MBH & COMBUSTION CHAMBER					6.00 Ea.	
Unit values		1.00	860.00	44.06	0.00	0.00	904.06
Totals		6.00	\$5,160	\$264	\$0	\$0	\$5,424
1554510160	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 100MBH					1.00 Ea.	
Unit values		6.00	1065.00	163.40	0.00	0.00	1228.40
Totals		6.00	\$1,065	\$163	\$0	\$0	\$1,228
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH					4.00 Ea.	
Unit values		4.00	935.00	81.70	0.00	0.00	1016.70
Totals		16.00	\$3,740	\$327	\$0	\$0	\$4,067
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					5.00 Ea.	
Unit values		1.60	70.00	76.50	0.00	0.00	146.50
Totals		8.00	\$350	\$382	\$0	\$0	\$732
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					6.00 Ea.	
Unit values		1.00	75.00	27.55	0.00	0.00	102.55
Totals		6.00	\$450	\$165	\$0	\$0	\$615

```
=====
Line #      Description
-----
              Manhours  Matl    Labor  Equipment  Sub      Total
=====
U15 MECHANICAL      272    $15,408    $6,286        $0        $0    $21,694
1631200100    HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58        0.00    1.00 Ea.    401.34
Totals           2.96    $331      $71          $0        $0        $402

U16 ELECTRICAL      3      $331      $71          $0        $0        $402
```

```
=====
Line #      Description
-----
      Manhours   Matl     Labor   Equipment   Sub     Total
=====
```

ESTIMATE TOTAL	344	\$16,758	\$8,461	\$0	\$0	\$25,219
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$16,758	\$8,461	\$0	\$0	\$25,219
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$25,219

```

=====
Estimate:      BLDG 6145      Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
A09 ELECTRICAL      69    $1,019    $2,104      $0      $0    $3,123
U15 MECHANICAL     272   $15,408    $6,286      $0      $0   $21,694
U16 ELECTRICAL       3     $331      $71        $0      $0    $402

TOTAL              344   $16,758    $8,461      $0      $0   $25,219

SALES TAX           0.00%      $0
MATL MARKUP         0.00%      $0
LABOR MARKUP        0.00%      $0
EQUIPT MARKUP       0.00%      $0
SUB MARKUP          0.00%      $0

TOTAL BEFORE CONTINGENC $16,758    $8,461      $0      $0   $25,219
CONTINGENCY          0.00%
BOND                 0.00%
PROFIT               0.00%

JOB TOTAL                                           $25,219
=====

```

```

=====
Estimate:      BLDG 6146          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP (GLASS Bid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    8100.00          City indx: Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					400.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		60.00	\$0	\$1,262	\$514	\$0	\$1,776
0207180380	HVAC DEMO, BOILER GAS/OIL STL >150MBH					1.00 Ea.	
Unit values		12.00	0.00	323.82	0.00	0.00	323.82
Totals		12.00	\$0	\$324	\$0	\$0	\$324
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.75 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		10.91	\$0	\$285	\$0	\$0	\$285
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					200.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		14.20	\$0	\$395	\$47	\$0	\$442
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					70.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		14.00	\$0	\$389	\$47	\$0	\$436
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE & DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT & WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		119	\$356	\$2,838	\$623	\$0	\$3,817

```

=====
Line #      Description
-----
              Manhours  Matl    Labor  Equipment    Sub    Total
=====

1554510245  HTG INFA-RD UNT GAS ELEC IGN  (See Attached for Breakdown)
                                     1.00 LS
Unit values      0.00      0.00      0.00      0.00 25219.00 25219.00
Totals           0.00      $0      $0      $0  $25,219  $25,219

1562600137  GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
              TYPE 1-1/4" PIPE SIZE
Unit values      0.53     226.00     12.10      0.00      0.00 238.10
Totals           0.53     $226      $12      $0      $0  $238

U15 MECHANICAL      1      $226      $12      $0  $25,219  $25,457

```

```
=====
Line #      Description
-----
              Manhours   Matl      Labor    Equipment    Sub      Total
=====
```

ESTIMATE TOTAL	120	\$582	\$2,850	\$623	\$25,219	\$29,274
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$582	\$2,850	\$623	\$25,219	\$29,274
CONTINGENCY	10.00%					\$2,927
BOND	0.00%					\$0
PROFIT	10.00%					\$2,927
JOB TOTAL						\$35,129

```

=====
Estimate:      BLDG 6146           Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    8100.00           City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
              Manhours   Matl     Labor   Equipment   Sub       Total
=====
U02 SITEWORK      119      $356    $2,838    $623        $0      $3,817
U15 MECHANICAL      1      $226      $12        $0      $25,219    $25,457
TOTAL              120      $582    $2,850    $623      $25,219    $29,274

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC  $582    $2,850    $623    $25,219    $29,274
CONTINGENCY        10.00%      $2,927
BOND               0.00%      $0
PROFIT            10.00%      $2,927
JOB TOTAL                          $35,129
=====

```

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=====
Estimate:      BLDG 6146           Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					340.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		50.66	\$753	\$1,555	\$0	\$0	\$2,308
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					120.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		17.88	\$266	\$549	\$0	\$0	\$815
A09 ELECTRICAL		69	\$1,019	\$2,104	\$0	\$0	\$3,123

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					330.00 L.F.	
Unit values		0.44	4.17	10.30	0.00	0.00	14.47
Totals		146.52	\$1,376	\$3,400	\$0	\$0	\$4,776
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNCR SZD FOR CVRG 10' OC 1/2" DIAM					450.00 L.F.	
Unit values		0.13	1.64	2.88	0.00	0.00	4.52
Totals		57.15	\$738	\$1,294	\$0	\$0	\$2,032
1519010320	ALUMINUM REFLECTORS W/HANGERS					45.00 Ea.	
Unit values		0.50	39.79	3.80	0.00	0.00	43.59
Totals		22.50	\$1,791	\$171	\$0	\$0	\$1,962
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.	
Unit values		3.00	738.35	120.15	0.00	0.00	858.50
Totals		3.00	\$738	\$120	\$0	\$0	\$858
1552301020	CRV-100 GAS FIRED BURNER, 100 MBH & COMBUSTION CHAMBER					6.00 Ea.	
Unit values		1.00	860.00	44.06	0.00	0.00	904.06
Totals		6.00	\$5,160	\$264	\$0	\$0	\$5,424
1554510160	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 100MBH					1.00 Ea.	
Unit values		6.00	1065.00	163.40	0.00	0.00	1228.40
Totals		6.00	\$1,065	\$163	\$0	\$0	\$1,228
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH					4.00 Ea.	
Unit values		4.00	935.00	81.70	0.00	0.00	1016.70
Totals		16.00	\$3,740	\$327	\$0	\$0	\$4,067
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					5.00 Ea.	
Unit values		1.60	70.00	76.50	0.00	0.00	146.50
Totals		8.00	\$350	\$382	\$0	\$0	\$732
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					6.00 Ea.	
Unit values		1.00	75.00	27.55	0.00	0.00	102.55
Totals		6.00	\$450	\$165	\$0	\$0	\$615

```
=====
Line #      Description
-----
              Manhours  Matl    Labor  Equipment  Sub    Total
=====
U15 MECHANICAL      272    $15,408    $6,286        $0        $0    $21,694
1631200100    HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58    0.00    1.00 Ea.    401.34
Totals            2.96    $331      $71      $0      $0      $402

U16 ELECTRICAL      3      $331      $71      $0      $0      $402
=====
```

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	344	\$16,758	\$8,461	\$0	\$0	\$25,219
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$16,758	\$8,461	\$0	\$0	\$25,219
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$25,219

=====

Estimate:	BLDG 6146	Date:	14-Oct-94
Description:	INFRARED HEATING SYSTEM COST ESTIMATE		
Project:	LIMITED EEAP (GLASS	Bid Date:	
Location:	FORT KNOX, KY	Job #:	94013.02
Sq. footage:	City indx: Louisville, KY		

=====

## SUMMARY

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	Manhours	Matl	Labor	Equipment	Sub	Total
=====						
A09 ELECTRICAL	69	\$1,019	\$2,104	\$0	\$0	\$3,123
U15 MECHANICAL	272	\$15,408	\$6,286	\$0	\$0	\$21,694
U16 ELECTRICAL	3	\$331	\$71	\$0	\$0	\$402
TOTAL	344	\$16,758	\$8,461	\$0	\$0	\$25,219
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$16,758	\$8,461	\$0	\$0	\$25,219
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$25,219

```

=====
Estimate:      BLDG 6147          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:   8100.00          City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					400.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		60.00	\$0	\$1,262	\$514	\$0	\$1,776
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.75 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		10.91	\$0	\$285	\$0	\$0	\$285
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					200.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		14.20	\$0	\$395	\$47	\$0	\$442
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					70.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		14.00	\$0	\$389	\$47	\$0	\$436
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		107	\$356	\$2,514	\$623	\$0	\$3,493



```
=====
Line #      Description
-----
              Manhours   Matl     Labor   Equipment   Sub     Total
=====
```

ESTIMATE TOTAL	108	\$582	\$2,526	\$623	\$25,219	\$28,950
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$582	\$2,526	\$623	\$25,219	\$28,950
CONTINGENCY	10.00%					\$2,895
BOND	0.00%					\$0
PROFIT	10.00%					\$2,895
JOB TOTAL						\$34,740

```

=====
Estimate:      BLDG 6147          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY      Job #:      94013.02
Sq. footage:  8100.00          City indx:Louisville, KY
=====

```

## SUMMARY

```

-----
Manhours  Matl  Labor  Equipment  Sub  Total
=====
U02 SITEWORK      107    $356    $2,514    $623      $0    $3,493
U15 MECHANICAL     1    $226     $12      $0    $25,219  $25,457
TOTAL             108    $582    $2,526    $623    $25,219  $28,950

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC  $582    $2,526    $623    $25,219  $28,950
CONTINGENCY         10.00%      $2,895
BOND                 0.00%      $0
PROFIT              10.00%      $2,895
JOB TOTAL                                     $34,740

```

```

=====
Estimate:      BLDG 6147          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					340.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		50.66	\$753	\$1,555	\$0	\$0	\$2,308
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					120.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		17.88	\$266	\$549	\$0	\$0	\$815
A09 ELECTRICAL		69	\$1,019	\$2,104	\$0	\$0	\$3,123

=====						
Line #	Description					
		Manhours	Matl	Labor	Equipment	Sub
=====						
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					330.00 L.F.
Unit values		0.44	4.17	10.30	0.00	0.00
Totals		146.52	\$1,376	\$3,400	\$0	\$0
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNGR SZD FOR CVRG 10'OC 1/2" DIAM					450.00 L.F.
Unit values		0.13	1.64	2.88	0.00	0.00
Totals		57.15	\$738	\$1,294	\$0	\$0
1519010320	ALUMINUM REFLECTORS W/HANGERS					45.00 Ea.
Unit values		0.50	39.79	3.80	0.00	0.00
Totals		22.50	\$1,791	\$171	\$0	\$0
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.
Unit values		3.00	738.35	120.15	0.00	0.00
Totals		3.00	\$738	\$120	\$0	\$0
1552301020	CRV-100 GAS FIRED BURNER, 100 MBH & COMBUSTION CHAMBER					6.00 Ea.
Unit values		1.00	860.00	44.06	0.00	0.00
Totals		6.00	\$5,160	\$264	\$0	\$0
1554510160	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 100MBH					1.00 Ea.
Unit values		6.00	1065.00	163.40	0.00	0.00
Totals		6.00	\$1,065	\$163	\$0	\$0
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH					4.00 Ea.
Unit values		4.00	935.00	81.70	0.00	0.00
Totals		16.00	\$3,740	\$327	\$0	\$0
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					5.00 Ea.
Unit values		1.60	70.00	76.50	0.00	0.00
Totals		8.00	\$350	\$382	\$0	\$0
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					6.00 Ea.
Unit values		1.00	75.00	27.55	0.00	0.00
Totals		6.00	\$450	\$165	\$0	\$0

```
=====
Line #      Description
-----
              Manhours  Matl    Labor  Equipment  Sub      Total
=====
U15 MECHANICAL      272    $15,408    $6,286        $0        $0    $21,694
1631200100    HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58    0.00    1.00 Ea.    401.34
Totals            2.96    $331      $71      $0      $0      $402

U16 ELECTRICAL      3      $331      $71      $0      $0      $402
```

```
=====
Line #      Description
-----
              Manhours   Matl      Labor    Equipment   Sub      Total
=====
```

ESTIMATE TOTAL	344	\$16,758	\$8,461	\$0	\$0	\$25,219
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$16,758	\$8,461	\$0	\$0	\$25,219
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$25,219

```

=====
Estimate:      BLDG 6147          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

## SUMMARY

```

-----
Manhours  Matl  Labor  Equipment  Sub  Total
=====
A09 ELECTRICAL      69    $1,019    $2,104        $0    $0    $3,123
U15 MECHANICAL     272    $15,408    $6,286        $0    $0    $21,694
U16 ELECTRICAL       3      $331      $71          $0    $0     $402
TOTAL              344    $16,758    $8,461        $0    $0    $25,219

SALES TAX           0.00%        $0
MATL MARKUP         0.00%        $0
LABOR MARKUP        0.00%        $0
EQUIPT MARKUP       0.00%        $0
SUB MARKUP          0.00%        $0

TOTAL BEFORE CONTINGENC $16,758    $8,461        $0    $0    $25,219
CONTINGENCY          0.00%
BOND                 0.00%
PROFIT               0.00%

JOB TOTAL                                $25,219

```

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 1 OF 3

BUILDING NUMBER: 6113

BUILDING HEATING TEMPERATURE SETPOINT: 60 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 59 F

INFILTRATION LOSSES = 1 AIR CHGS X 114900 VOL (CU FT) X 59 F TEMP DIFF X 0.019 = 0.13 MBTU / HR

FLOOR LOSSES = 350 LINEAR FEET OF PERIMETER X 59 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	6900	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2936	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.07	MBTU / HR
CORR MTL PNL WALL =	1165	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
TINTED DBL PANE WIN"W =		AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =	1344	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
METAL GLAZED O'HEAD DR =		AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL=	25	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL BASELINE HEAT LOSSES

= 0.37 MBTU / HR  
= 388.28 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 6113

BUILDING HEATING TEMPERATURE SETPOINT: 55 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 54 F

INFILTRATION LOSSES = 1 AIR CHGS X 114900 VOL (CU FT) X 54 F TEMP DIFF X 0.019 = 0.12 MBTU / HR

FLOOR LOSSES = 350 LINEAR FEET OF PERIMETER X 54 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	6900	AREA (SF)	X	0.105	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
FACE BRICK/BLK WALL =	0	AREA (SF)	X	0.176	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2936	AREA (SF)	X	0.389	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
CORR MTL PNL WALL =	1165	AREA (SF)	X	0.17	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF)	X	1.235	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
TINTED DBL PANE WIN'W =	0	AREA (SF)	X	0.65	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =	1344	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
WOOD GLAZED O'HEAD DR =	0	AREA (SF)	X	0.214	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG MTL SLIDING DOOR =	0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=	0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL=	25	AREA (SF)	X	0.615	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL ECO HEAT LOSSES

= 0.34 MBTU / HR  
= 355.37 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	BUILDING NUMBER	6113	GLOSSARY OF TERMS
SYSTEM EFFICIENCY			1 MBTU = 1055 MJ
OUTSIDE DESIGN TEMP (F)	60%	90%	0.019=CONSTANT
HTG TEMP SETPOINT (F)	1	1	.81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE
HEATING DEGREE DAYS	60	55	CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS
TOTAL HEAT LOSSES	4616	3396	65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2
(MBTU / HR)	0.37	0.34	
\$ /MBTU -FUEL OIL	\$6.60	\$6.60	
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62	
\$ /MBTU -PPG	\$10.84	\$10.84	

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.37	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	1,151.76	MBTU/YR
	0.6	SYS EFF	X	59	TEMP DIFFERENCE						
ECO - 1 =	1,151.76	MBTU/YR	X		CORR FACTOR		1		=	1,151.76	MBTU/YR
	0.34	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY			
	0.9	SYS EFF	X	54	TEMP DIFFERENCE				=	564.90	MBTU/YR
	564.90	MBTU/YR	X		CORR FACTOR		1				
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS											
									=	586.86	MBTU/YR

## ANNUAL HEATING ENERGY COST

<b>BASELINE =</b>	1,151.76	MBTU / YR	X	6.6	\$ /MBTU	=	7,601.62	\$ /YR
<b>ECO - 1 =</b>	564.90	MBTU / YR	X	4.62	\$ /MBTU	=	2,609.84	\$ /YR
<b>ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS =</b>								<b>4,991.77 \$ /YR</b>

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 6114		BUILDING HEATING TEMPERATURE SETPOINT: 60 F		PAGE 1 OF 3			
		OUTSIDE DESIGN TEMPERATURE		1 F			
		TEMPERATURE DIFFERENCE		59 F			
INFILTRATION LOSSES =	1	AIR CHGS X	114900	VOL (CU FT) X	59 F TEMP DIFF X 0.019 =	0.13	MBTU / HR
FLOOR LOSSES =	350	LINEAR FEET OF PERIMETER X		59 F TEMP DIFF X 0.81 =	0.02	0.02	MBTU / HR
SURFACE HEAT LOSSES							
FLAT BUILT UP ROOF =	6900	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE =	0.04	MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE =	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2936	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE =	0.07	MBTU / HR
CORR MTL PNL WALL =	1165	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE =	0.01	MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE =	0.06	MBTU / HR
TINTED DBL PANE WIN'W =		AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE =	0.00	MBTU / HR
METAL ROLL UP DOORS =	1344	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE =	0.04	MBTU / HR
METAL GLAZED O'HEAD DR =		AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE =	0.00	MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE =	0.00	MBTU / HR
METAL PERSONNEL DR=		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE =	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL=	25	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	59 F TEMPERATURE DIFFERENCE =	0.00	MBTU / HR
TOTAL BASELINE HEAT LOSSES						= 0.37	MBTU / HR
						= 388.28	MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 6114		BUILDING HEATING TEMPERATURE SETPOINT: 55 F				PAGE 2 OF 3	
		OUTSIDE DESIGN TEMPERATURE 1 F					
		TEMPERATURE DIFFERENCE 54 F					
INFILTRATION LOSSES =		1	AIR CHGS X	114900	VOL (CU FT) X	54 F TEMP DIFF X	0.019 = 0.12 MBTU / HR
FLOOR LOSSES =		350	LINEAR FEET OF PERIMETER X	54 F TEMP DIFF X	0.81 =	0.02	MBTU / HR
SURFACE HEAT LOSSES							
FLAT BUILT UP ROOF =		6900	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	54 F TEMPERATURE DIFFERENCE	= 0.04 MBTU / HR
FACE BRICK/BLK WALL =		0	AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	54 F TEMPERATURE DIFFERENCE	= 0.00 MBTU / HR
8" CINDER BLOCK WALL =		2936	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	54 F TEMPERATURE DIFFERENCE	= 0.06 MBTU / HR
CORR MTL PNL WALL =		1165	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	54 F TEMPERATURE DIFFERENCE	= 0.01 MBTU / HR
CLR SGL PANE WINDOWS =		760	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	54 F TEMPERATURE DIFFERENCE	= 0.05 MBTU / HR
TINTED DBL PANE WIN'W =		0	AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	54 F TEMPERATURE DIFFERENCE	= 0.00 MBTU / HR
METAL ROLL UP DOORS =		1344	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54 F TEMPERATURE DIFFERENCE	= 0.04 MBTU / HR
WOOD GLAZED O'HEAD DR =		0	AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	54 F TEMPERATURE DIFFERENCE	= 0.00 MBTU / HR
LG MTL SLIDING DOOR =		0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54 F TEMPERATURE DIFFERENCE	= 0.00 MBTU / HR
METAL PERSONNEL DR=		0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54 F TEMPERATURE DIFFERENCE	= 0.00 MBTU / HR
MTL/GLAZED PERSONNEL=		25	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	54 F TEMPERATURE DIFFERENCE	= 0.00 MBTU / HR
TOTAL ECO HEAT LOSSES						=	0.34 MBTU / HR
						=	355.37 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	BUILDING NUMBER	6114	GLOSSARY OF TERMS
SYSTEM EFFICIENCY	ECO - 1	90%	1 MBTU = 1055 MJ
OUTSIDE DESIGN TEMP (F)	60%	1	0.019=CONSTANT
HTG TEMP SETPOINT (F)	60	55	.81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE
HEATING DEGREE DAYS	4616	3396	CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS
TOTAL HEAT LOSSES	0.37	0.34	65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2
(MBTU / HR)			
\$ /MBTU -FUEL OIL	\$6.60	\$6.60	
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62	
\$ /MBTU -PPG	\$10.84	\$10.84	

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.37	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY				
	0.6	SYS EFF	X	59	TEMP DIFFERENCE				=	1,151.76	MBTU/YR	
	1,151.76	MBTU/YR							=			
											1,151.76	MBTU/YR
ECO - 1 =	0.34	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY				
	0.9	SYS EFF	X	54	TEMP DIFFERENCE				=	564.90	MBTU/YR	
	564.90	MBTU/YR							=			
											564.90	MBTU/YR
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS =												
=												
										586.86	MBTU/YR	
										619,135.94	MJ/YR	

## ANNUAL HEATING ENERGY COST

BASELINE =	1,151.76	MBTU / YR	X	6.6	\$ /MBTU		=	7,601.62	\$ /YR
ECO - 1 =	564.90	MBTU / YR	X	4.62	\$ /MBTU		=	2,609.84	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS =									
=									
								4,991.77	\$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 1 OF 3

BUILDING NUMBER: 6115

BUILDING HEATING TEMPERATURE SETPOINT: 60 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 59 F

INFILTRATION LOSSES = 1 AIR CHGS X 114900 VOL (CU FT) X 59 F TEMP DIFF X 0.019 = 0.13 MBTU / HR  
FLOOR LOSSES = 350 LINEAR FEET OF PERIMETER X 59 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	6900	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2936	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.07	MBTU / HR
CORR MTL PNL WALL =	1165	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
TINTED DBL PANE WIN'W =		AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =	1344	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
METAL GLAZED O'HEAD DR =		AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL =	25	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL BASELINE HEAT LOSSES

= 0.37 MBTU / HR  
= 388.28 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 6115		BUILDING HEATING TEMPERATURE SETPOINT: 55 F			
		OUTSIDE DESIGN TEMPERATURE 1 F			
		TEMPERATURE DIFFERENCE 54 F			
INFILTRATION LOSSES =		1	AIR CHGS X 114900	VOL (CU FT) X 54 F TEMP DIFF X 0.019	= 0.12 MBTU / HR
FLOOR LOSSES =		350	LINEAR FEET OF PERIMETER X	54 F TEMP DIFF X 0.81	= 0.02 MBTU / HR
SURFACE HEAT LOSSES					
FLAT BUILT UP ROOF =		6900	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.04 MBTU / HR
FACE BRICK/BLK WALL =		0	AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
8" CINDER BLOCK WALL =		2936	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.06 MBTU / HR
CORR MTL PNL WALL =		1165	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.01 MBTU / HR
CLR SGL PANE WINDOWS =		760	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR
TINTED DBL PANE WIN'W =		0	AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL ROLL UP DOORS =		1344	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.04 MBTU / HR
WOOD GLAZED O'HEAD DR =		0	AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
LG MTL SLIDING DOOR =		0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL PERSONNEL DR=		0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
MTL/ GLAZED PERSONNEL=		25	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
TOTAL ECO HEAT LOSSES					= 0.34 MBTU / HR
					= 355.37 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

BUILDING NUMBER	6115	GLOSSARY OF TERMS
1 MBTU = 1055 MJ		
0.019=CONSTANT		
.81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE		
CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS		
65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2		

	BASELINE	ECO - 1
SYSTEM EFFICIENCY	60%	90%
OUTSIDE DESIGN TEMP (F)	1	1
HTG TEMP SETPOINT (F)	60	55
HEATING DEGREE DAYS	4616	3396
TOTAL HEAT LOSSES (MBTU / HR)	0.37	0.34
\$ /MBTU -FUEL OIL	\$6.60	\$6.60
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62
\$ /MBTU -PPG	\$10.84	\$10.84

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.37	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	1,151.76	MBTU/YR
	0.6	SYS EFF	X	59	TEMP DIFFERENCE						
ECO - 1 =	1,151.76	MBTU/YR	X		CORR FACTOR		1		=	1,151.76	MBTU/YR
	0.34	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	564.90	MBTU/YR
	0.9	SYS EFF	X	54	TEMP DIFFERENCE						
	564.90	MBTU/YR	X		CORR FACTOR		1		=	564.90	MBTU/YR
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS	=								=	586.86	MBTU/YR
										619,135.94	MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	1,151.76	MBTU / YR	X	6.6	\$ /MBTU	=	7,601.62	\$ /YR
ECO - 1 =	564.90	MBTU / YR	X	4.62	\$ /MBTU	=	2,609.84	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS	=					=	4,991.77	\$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 1 OF 3

BUILDING NUMBER: 6116 BUILDING HEATING TEMPERATURE SETPOINT: 60 F  
 OUTSIDE DESIGN TEMPERATURE 1 F  
 TEMPERATURE DIFFERENCE 59 F

INFILTRATION LOSSES = 1 AIR CHGS X 114900 VOL (CU FT) X 59 F TEMP DIFF X 0.019 = 0.13 MBTU / HR  
 FLOOR LOSSES = 350 LINEAR FEET OF PERIMETER X 59 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	6900	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2936	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.07	MBTU / HR
CORR MTL PNL WALL =	1165	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
TINTED DBL PANE WIN'W =		AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =	1344	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
METAL GLAZED O'HEAD DR =		AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL=	25	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL BASELINE HEAT LOSSES

= 0.37 MBTU / HR  
 = 388.28 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 6116

BUILDING HEATING TEMPERATURE SETPOINT: 55 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 54 F

INFILTRATION LOSSES = 1 AIR CHGS X 114900 VOL (CU FT) X 54 F TEMP DIFF X 0.019 = 0.12 MBTU / HR

FLOOR LOSSES = 350 LINEAR FEET OF PERIMETER X 54 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF = 6900 AREA (SF) X 0.105 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.04 MBTU / HR

FACE BRICK/BLK WALL = 0 AREA (SF) X 0.176 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

8" CINDER BLOCK WALL = 2936 AREA (SF) X 0.389 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.06 MBTU / HR

CORR MTL PNL WALL = 1165 AREA (SF) X 0.17 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.01 MBTU / HR

CLR SGL PANE WINDOWS = 760 AREA (SF) X 1.235 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR

TINTED DBL PANE WIN'W = 0 AREA (SF) X 0.65 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

METAL ROLL UP DOORS = 1344 AREA (SF) X 0.56 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.04 MBTU / HR

WOOD GLAZED O'HEAD DR = 0 AREA (SF) X 0.214 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

LG MTL SLIDING DOOR = 0 AREA (SF) X 0.56 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

METAL PERSONNEL DR = 0 AREA (SF) X 0.56 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

MTL/ GLAZED PERSONNEL = 25 AREA (SF) X 0.615 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

### TOTAL ECO HEAT LOSSES

= 0.34 MBTU / HR  
= 355.37 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	BASELINE	ECO - 1
SYSTEM EFFICIENCY	60%	90%
OUTSIDE DESIGN TEMP (F)	1	1
HTG TEMP SETPOINT (F)	60	55
HEATING DEGREE DAYS	4616	3396
TOTAL HEAT LOSSES (MBTU / HR)	0.37	0.34
\$ /MBTU -FUEL OIL	\$6.60	\$6.60
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62
\$ /MBTU -PPG	\$10.84	\$10.84

BUILDING NUMBER 6116

### GLOSSARY OF TERMS

1 MBTU = 1055 MJ  
 0.019=CONSTANT  
 .81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE  
 CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS  
 65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.37	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	1,151.76	MBTU/YR
	0.6	SYSEFF	X	59	TEMP DIFFERENCE						
	1,151.76	MBTU/YR	X		CORR FACTOR		1		=	1,151.76	MBTU/YR
ECO - 1 =	0.34	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	564.90	MBTU/YR
	0.9	SYSEFF	X	54	TEMP DIFFERENCE						
	564.90	MBTU/YR	X		CORR FACTOR		1		=	564.90	MBTU/YR
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS =											
										586.86	MBTU/YR
										619,135.94	MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	1,151.76	MBTU / YR	X	6.6	\$ /MBTU	=	7,601.62	\$ /YR
ECO - 1 =	564.90	MBTU / YR	X	4.62	\$ /MBTU	=	2,609.84	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS =								4,991.77
								\$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 1 OF 3

BUILDING NUMBER: 6117

BUILDING HEATING TEMPERATURE SETPOINT: 60 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 59 F

INFILTRATION LOSSES = 1 AIR CHGS X 114900 VOL (CU FT) X 59 F TEMP DIFF X 0.019 = 0.13 MBTU / HR

FLOOR LOSSES = 350 LINEAR FEET OF PERIMETER X 59 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	6900	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2936	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.07	MBTU / HR
CORR MTL PNL WALL =	1165	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
TINTED DBL PANE WIN"W =		AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =	1344	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
METAL GLAZED O'HEAD DR =		AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/GLAZED PERSONNEL=	25	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL BASELINE HEAT LOSSES

= 0.37 MBTU / HR  
= 388.28 MJ/HR

## ECO - 1: INFRARED HEATING CALCULATIONS

**PAGE 2 OF 3**

BUILDING NUMBER:	6117	BUILDING HEATING TEMPERATURE SETPOINT:	55 F
		OUTSIDE DESIGN TEMPERATURE	1 F
		TEMPERATURE DIFFERENCE	54 F

INFILTRATION LOSSES =	1	AIR CHGS	X	114900	VOL (CU FT)	X	54	F TEMP DIFF	X	0.019	=	0.12	MBTU / HR
FLOOR LOSSES =	350	LINEAR FEET OF PERIMETER	X	54	F TEMP DIFF	X	0.81	=	0.02	MBTU / HR			

## SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	6900	AREA (SF)	X	0.105	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
FACE BRICK/BLK WALL =	0	AREA (SF)	X	0.176	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2936	AREA (SF)	X	0.389	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
CORR MTL PNL WALL =	1165	AREA (SF)	X	0.17	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF)	X	1.235	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
TINTED DBL PANE WIN"W =	0	AREA (SF)	X	0.65	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =	1344	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
WOOD GLAZED O'HEAD DR =	0	AREA (SF)	X	0.214	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG MTL SLIDING DOOR =	0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=	0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL=	25	AREA (SF)	X	0.615	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

TOTAL ECO HEAT LOSSES	=	0.34	MBTU / HR
	=	355.37	MJ/HR



# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 1 OF 3

BUILDING NUMBER: 6118

BUILDING HEATING TEMPERATURE SETPOINT: 60 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 59 F

INFILTRATION LOSSES = 1 AIR CHGS X 114900 VOL (CU FT) X 59 F TEMP DIFF X 0.019 = 0.13 MBTU / HR  
FLOOR LOSSES = 350 LINEAR FEET OF PERIMETER X 59 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	6900	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2936	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.07	MBTU / HR
CORR MTL PNL WALL =	1165	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
TINTED DBL PANE WIN'W =		AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =	1344	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
METAL GLAZED O'HEAD DR =		AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/GLAZED PERSONNEL =	25	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL BASELINE HEAT LOSSES

= 0.37 MBTU / HR  
= 388.28 MJ/HR

## ECO - 1: INFRARED HEATING CALCULATIONS

**PAGE 2 OF 3**

BUILDING HEATING TEMPERATURE SETPOINT:	55 F
OUTSIDE DESIGN TEMPERATURE	1 F
TEMPERATURE DIFFERENCE	<u>54 F</u>

**BUILDING NUMBER: 6118**

$$\text{INFILTRATION LOSSES} = 1 \text{ AIR CHGS} \times 114900 \text{ VOL (CU FT)} \times 54 \text{ F TEMP DIFF} \times 0.019 = 0.12 \text{ MBTU / HR}$$
$$\text{FLOOR LOSSES} = 350 \quad \text{LINEAR FEET OF PERIMETER} \times 54 \text{ F TEMP DIFF} \times 0.01 = 0.02 \text{ MBTU / HR}$$

## SURFACE HEAT LOSSES

	F	TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
FLAT BUILT UP ROOF =	6900	AREA (SF)	X	0.105	U VALUE (BTU/HR - SF - F) X
FACE BRICK/BLK WALL =	0	AREA (SF)	X	0.176	U VALUE (BTU/HR - SF - F) X
8" CINDER BLOCK WALL =	2936	AREA (SF)	X	0.389	U VALUE (BTU/HR - SF - F) X
CORR MTL PNL WALL =	1165	AREA (SF)	X	0.17	U VALUE (BTU/HR - SF - F) X
CLR SGL PANE WINDOWS =	760	AREA (SF)	X	1.235	U VALUE (BTU/HR - SF - F) X
TINTED DBL PANE WIN"W =	0	AREA (SF)	X	0.65	U VALUE (BTU/HR - SF - F) X
METAL ROLL UP DOORS =	1344	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F) X
WOOD GLAZED O'HEAD DR =	0	AREA (SF)	X	0.214	U VALUE (BTU/HR - SF - F) X
LG MTL SLIDING DOOR =	0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F) X
METAL PERSONNEL DR=	0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F) X
MTL/ GLAZED PERSONNEL=	25	AREA (SF)	X	0.615	U VALUE (BTU/HR - SF - F) X

TOTAL ECO HEAT LOSSES

=	0.34	MBTU / HR
=	355.37	MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	BUILDING NUMBER	6118	GLOSSARY OF TERMS
SYSTEM EFFICIENCY	60%	90%	1 MBTU = 1055 MJ
OUTSIDE DESIGN TEMP (F)	1	55	0.019=CONSTANT
HTG TEMP SETPOINT (F)	60	3396	.81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE
HEATING DEGREE DAYS	4616	0.34	CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS
TOTAL HEAT LOSSES	0.37	\$6.60	65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2
(MBTU / HR)		\$4.62	
\$ /MBTU -FUEL OIL		\$10.84	
\$ /MBTU -NATURAL GAS			
\$ /MBTU -PPG			

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.37	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	1,151.76	MBTU/YR
	0.6	SYS EFF	X	59	TEMP DIFFERENCE						
ECO - 1 =	1,151.76	MBTU/YR	X		CORR FACTOR		1		=	1,151.76	MBTU/YR
	0.34	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	564.90	MBTU/YR
	0.9	SYS EFF	X	54	TEMP DIFFERENCE						
	564.90	MBTU/YR	X		CORR FACTOR		1		=	564.90	MBTU/YR
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS									=	586.86	MBTU/YR
									=	619,135.94	MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	1,151.76	MBTU / YR	X	6.6	\$ /MBTU	=	7,601.62	\$ /YR
ECO - 1 =	564.90	MBTU / YR	X	4.62	\$ /MBTU	=	2,609.84	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS						=	4,991.77	\$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 1 OF 3

BUILDING NUMBER: 6142

BUILDING HEATING TEMPERATURE SETPOINT: 60 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 59 F

INFILTRATION LOSSES = 1 AIR CHGS X 138900 VOL (CU FT) X 59 F TEMP DIFF X 0.019 = 0.16 MBTU / HR  
FLOOR LOSSES = 390 LINEAR FEET OF PERIMETER X 59 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	8100	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2743	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
CORR MTL PNL WALL =	1685	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.02	MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
TINTED DBL PANE WIN'W =		AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =	1792	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
METAL GLAZED O'HEAD DR =		AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/GLAZED PERSONNEL =	50	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

TOTAL BASELINE HEAT LOSSES = 0.42 MBTU / HR  
= 443.92 MJ / HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 6142

BUILDING HEATING TEMPERATURE SETPOINT: 55 F

OUTSIDE DESIGN TEMPERATURE

1 F

TEMPERATURE DIFFERENCE

54 F

INFILTRATION LOSSES = 1 AIR CHGS X 138900 VOL (CU FT) X 54 F TEMP DIFF X 0.019 = 0.14 MBTU / HR

FLOOR LOSSES = 390 LINEAR FEET OF PERIMETER X 54 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	8100	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
FACE BRICK/BLK WALL =	0	AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2743	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
CORR MTL PNL WALL =	1685	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.02	MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
TINTED DBL PANE WIN'W' =	0	AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =	1792	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
WOOD GLAZED O'HEAD DR =	0	AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG MTL SLIDING DOOR =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL =	50	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL ECO HEAT LOSSES

= 0.39 MBTU / HR

= 406.30 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	BUILDING NUMBER	6142	GLOSSARY OF TERMS
SYSTEM EFFICIENCY	60%	ECO - 1	1 MBTU = 1055 MJ
OUTSIDE DESIGN TEMP (F)	1	90%	0.019=CONSTANT
HTG TEMP SETPOINT (F)	60	55	.81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE
HEATING DEGREE DAYS	4616	3396	CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS
TOTAL HEAT LOSSES	0.42	0.39	65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2
(MBTU / HR)			
\$ /MBTU -FUEL OIL	\$6.60	\$6.60	
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62	
\$ /MBTU -PPG	\$10.84	\$10.84	

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.42	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	1,316.82	MBTU/YR
	0.6	SYS EFF	X	59	TEMP DIFFERENCE						
ECO - 1 =	1,316.82	MBTU/YR	X		CORR FACTOR	1			=	1,316.82	MBTU/YR
	0.39	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	645.86	MBTU/YR
	0.9	SYS EFF	X	54	TEMP DIFFERENCE						
	645.86	MBTU/YR	X		CORR FACTOR	1			=	645.86	MBTU/YR
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS	=								=	670.96	MBTU/YR
										707,867.19	MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	1,316.82	MBTU / YR	X	6.6	\$ /MBTU	=	8,691.04	\$ /YR
ECO - 1 =	645.86	MBTU / YR	X	4.62	\$ /MBTU	=	2,983.87	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS	=					=	5,707.17	\$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 6143		BUILDING HEATING TEMPERATURE SETPOINT: 60 F		PAGE 1 OF 3	
		OUTSIDE DESIGN TEMPERATURE 1 F			
		TEMPERATURE DIFFERENCE 59 F			
INFILTRATION LOSSES =	1	AIR CHGS X	138900	VOL (CU FT) X	59 F TEMP DIFF X 0.019 = 0.16 MBTU / HR
FLOOR LOSSES =	390	LINEAR FEET OF PERIMETER X	59	F TEMP DIFF X	0.81 = 0.02 MBTU / HR
<b>SURFACE HEAT LOSSES</b>					
FLAT BUILT UP ROOF =	8100	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
8" CINDER BLOCK WALL =	2743	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.06 MBTU / HR
CORR MTL PNL WALL =	1685	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.02 MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.06 MBTU / HR
TINTED DBL PANE WIN'W =		AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL ROLL UP DOORS =	1792	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.06 MBTU / HR
METAL GLAZED O'HEAD DR =		AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL PERSONNEL DR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
MTL/ GLAZED PERSONNEL =	50	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
<b>TOTAL BASELINE HEAT LOSSES</b>				=	<b>0.42 MBTU / HR</b>
				=	<b>443.92 MJ/HR</b>

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 6143		BUILDING HEATING TEMPERATURE SETPOINT: 55 F					
		OUTSIDE DESIGN TEMPERATURE		1 F			
		TEMPERATURE DIFFERENCE		54 F			
INFILTRATION LOSSES =	1	AIR CHGS	X	138900	VOL (CU FT)	X	54 F TEMP DIFF X 0.019 = 0.14 MBTU / HR
FLOOR LOSSES =	390	LINEAR FEET OF PERIMETER	X	54 F TEMP DIFF	X	0.81	= 0.02 MBTU / HR
SURFACE HEAT LOSSES							
FLAT BUILT UP ROOF =	8100	AREA (SF)	X	0.105	U VALUE (BTU/HR - SF - F)	X	F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR
FACE BRICK/BLK WALL =	0	AREA (SF)	X	0.176	U VALUE (BTU/HR - SF - F)	X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
8" CINDER BLOCK WALL =	2743	AREA (SF)	X	0.389	U VALUE (BTU/HR - SF - F)	X	F TEMPERATURE DIFFERENCE = 0.06 MBTU / HR
CORR MTL PNL WALL =	1685	AREA (SF)	X	0.17	U VALUE (BTU/HR - SF - F)	X	F TEMPERATURE DIFFERENCE = 0.02 MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF)	X	1.235	U VALUE (BTU/HR - SF - F)	X	F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR
TINTED DBL PANE WIN'W =	0	AREA (SF)	X	0.65	U VALUE (BTU/HR - SF - F)	X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL ROLL UP DOORS =	1792	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR
WOOD GLAZED O'HEAD DR =	0	AREA (SF)	X	0.214	U VALUE (BTU/HR - SF - F)	X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
LG MTL SLIDING DOOR =	0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL PERSONNEL DR =	0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
MTL/ GLAZED PERSONNEL =	50	AREA (SF)	X	0.615	U VALUE (BTU/HR - SF - F)	X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
TOTAL ECO HEAT LOSSES							= 0.39 MBTU / HR
							= 406.30 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	BASELINE	ECO - 1
SYSTEM EFFICIENCY	60%	90%
OUTSIDE DESIGN TEMP (F)	1	1
HTG TEMP SETPOINT (F)	60	55
HEATING DEGREE DAYS	4616	3396
TOTAL HEAT LOSSES (MBTU / HR)	0.42	0.39
\$ /MBTU -FUEL OIL	\$6.60	\$6.60
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62
\$ /MBTU -PPG	\$10.84	\$10.84

BUILDING NUMBER 6143

### GLOSSARY OF TERMS

1 MBTU = 1055 MJ  
 0.019=CONSTANT  
 .81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE  
 CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS  
 65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.42	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	1,316.82	MBTU/YR
	0.6	SYS EFF	X	59	TEMP DIFFERENCE						
	1,316.82	MBTU/YR		X	CORR FACTOR		1		=		1,316.82 MBTU/YR
ECO - 1 =	0.39	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	645.86	MBTU/YR
	0.9	SYS EFF	X	54	TEMP DIFFERENCE						
	645.86	MBTU/YR		X	CORR FACTOR		1		=		645.86 MBTU/YR
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS =											670.96 MBTU/YR
											707,867.19 MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	1,316.82	MBTU / YR	X	6.6	\$ /MBTU	=	8,691.04	\$ /YR
ECO - 1 =	645.86	MBTU / YR	X	4.62	\$ /MBTU	=	2,983.87	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS =								5,707.17 \$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 6144		BUILDING HEATING TEMPERATURE SETPOINT: 60 F				PAGE 1 OF 3	
		OUTSIDE DESIGN TEMPERATURE				1 F	
		TEMPERATURE DIFFERENCE				59 F	
INFILTRATION LOSSES =	1	AIR CHGS	X	138900	VOL (CU FT)	X	59 F TEMP DIFF X 0.019 = 0.16 MBTU / HR
FLOOR LOSSES =	390	LINEAR FEET OF PERIMETER	X	59	F TEMP DIFF	X	0.81 = 0.02 MBTU / HR
SURFACE HEAT LOSSES							
FLAT BUILT UP ROOF =	8100	AREA (SF)	X	0.105	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF)	X	0.176	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
8" CINDER BLOCK WALL =	2743	AREA (SF)	X	0.389	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE = 0.06 MBTU / HR
CORR MTL PNL WALL =	1685	AREA (SF)	X	0.17	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE = 0.02 MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF)	X	1.235	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE = 0.06 MBTU / HR
TINTED DBL PANE WIN'W =		AREA (SF)	X	0.65	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL ROLL UP DOORS =	1792	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE = 0.06 MBTU / HR
METAL GLAZED O'HEAD DR =		AREA (SF)	X	0.214	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL PERSONNEL DR =		AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
MTL/ GLAZED PERSONNEL =	50	AREA (SF)	X	0.615	U VALUE (BTU/HR - SF - F)	X	59 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
TOTAL BASELINE HEAT LOSSES						= 0.42 MBTU / HR	
						= 443.92 MJ/HR	

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 6144		BUILDING HEATING TEMPERATURE SETPOINT: 55 F										PAGE 2 OF 3	
		OUTSIDE DESIGN TEMPERATURE 1 F											
		TEMPERATURE DIFFERENCE 54 F											
INFILTRATION LOSSES =		1	AIR CHGS	X	138900	VOL (CU FT)	X	54 F TEMP DIFF	X	0.019	=	0.14	MBTU / HR
FLOOR LOSSES =		390	LINEAR FEET OF PERIMETER		X	54 F TEMP DIFF	X	0.81	=	0.02	MBTU / HR		
SURFACE HEAT LOSSES													
FLAT BUILT UP ROOF =		8100	AREA (SF)	X	0.105	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR		
FACE BRICK/BLK WALL =		0	AREA (SF)	X	0.176	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR		
8" CINDER BLOCK WALL =		2743	AREA (SF)	X	0.389	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR		
CORR MTL PNL WALL =		1685	AREA (SF)	X	0.17	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE	=	0.02	MBTU / HR		
CLR SGL PANE WINDOWS =		760	AREA (SF)	X	1.235	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR		
TINTED DBL PANE WIN'W =		0	AREA (SF)	X	0.65	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR		
METAL ROLL UP DOORS =		1792	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR		
WOOD GLAZED O'HEAD DR =		0	AREA (SF)	X	0.214	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR		
LG MTL SLIDING DOOR =		0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR		
METAL PERSONNEL DR=		0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR		
MTU/ GLAZED PERSONNEL=		50	AREA (SF)	X	0.615	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR		
TOTAL ECO HEAT LOSSES										=	0.39	MBTU / HR	
										=	406.30	MJ/HR	

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	BASELINE	ECO - 1
SYSTEM EFFICIENCY	60%	90%
OUTSIDE DESIGN TEMP (F)	1	1
HTG TEMP SETPOINT (F)	60	55
HEATING DEGREE DAYS	4616	3396
TOTAL HEAT LOSSES (MBTU / HR)	0.42	0.39
\$ /MBTU -FUEL OIL	\$6.60	\$6.60
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62
\$ /MBTU -PPG	\$10.84	\$10.84

BUILDING NUMBER 6144

### GLOSSARY OF TERMS

1 MBTU = 1055 MJ  
 0.019=CONSTANT  
 .81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE  
 CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS  
 65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.42	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	1,316.82	MBTU/YR
	0.6	SYS EFF	X	59	TEMP DIFFERENCE						
	1,316.82	MBTU/YR								1,316.82	MBTU/YR
ECO - 1 =	0.39	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	645.86	MBTU/YR
	0.9	SYS EFF	X	54	TEMP DIFFERENCE						
	645.86	MBTU/YR								645.86	MBTU/YR
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS	=									670.96	MBTU/YR
										707,867.19	MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	1,316.82	MBTU / YR	X	6.6	\$ /MBTU	=	8,691.04	\$ /YR
ECO - 1 =	645.86	MBTU / YR	X	4.62	\$ /MBTU	=	2,983.87	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS	=						5,707.17	\$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 6145										PAGE 1 OF 3				
BUILDING HEATING TEMPERATURE SETPOINT: 60 F														
OUTSIDE DESIGN TEMPERATURE 1 F														
TEMPERATURE DIFFERENCE 59 F														
INFILTRATION LOSSES =		1	AIR CHGS	X	138900	VOL (CU FT)	X	59	F TEMP DIFF	X	0.019	=	0.16	MBTU / HR
FLOOR LOSSES =		390	LINEAR FEET OF PERIMETER		X	59	F TEMP DIFF	X	0.81	=	0.02	MBTU / HR		
SURFACE HEAT LOSSES														
FLAT BUILT UP ROOF =		8100	AREA (SF)	X	0.105	U VALUE (BTU/HR - SF - F)	X	59	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR		
FACE BRICK/BLK WALL =			AREA (SF)	X	0.176	U VALUE (BTU/HR - SF - F)	X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR		
8" CINDER BLOCK WALL =		2743	AREA (SF)	X	0.389	U VALUE (BTU/HR - SF - F)	X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR		
CORR MTL PNL WALL =		1685	AREA (SF)	X	0.17	U VALUE (BTU/HR - SF - F)	X	59	F TEMPERATURE DIFFERENCE	=	0.02	MBTU / HR		
CLR SGL PANE WINDOWS =		760	AREA (SF)	X	1.235	U VALUE (BTU/HR - SF - F)	X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR		
TINTED DBL PANE WIN'W =			AREA (SF)	X	0.65	U VALUE (BTU/HR - SF - F)	X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR		
METAL ROLL UP DOORS =		1792	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR		
METAL GLAZED O'HEAD DR =			AREA (SF)	X	0.214	U VALUE (BTU/HR - SF - F)	X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR		
LG MTL SLIDING DOOR =			AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR		
METAL PERSONNEL DR =			AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR		
MTL/ GLAZED PERSONNEL =		50	AREA (SF)	X	0.615	U VALUE (BTU/HR - SF - F)	X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR		
TOTAL BASELINE HEAT LOSSES										=	0.42	MBTU / HR		
										=	443.92	MJ/HR		

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 6145 BUILDING HEATING TEMPERATURE SETPOINT: 55 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 54 F

INFILTRATION LOSSES = 1 AIR CHGS X 138900 VOL (CU FT) X 54 F TEMP DIFF X 0.019 = 0.14 MBTU / HR

FLOOR LOSSES = 390 LINEAR FEET OF PERIMETER X 54 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF = 8100 AREA (SF) X 0.105 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR

FACE BRICK/BLK WALL = 0 AREA (SF) X 0.176 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

8" CINDER BLOCK WALL = 2743 AREA (SF) X 0.389 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.06 MBTU / HR

CORR MTL PNL WALL = 1685 AREA (SF) X 0.17 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.02 MBTU / HR

CLR SGL PANE WINDOWS = 760 AREA (SF) X 1.235 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR

TINTED DBL PANE WIN'W = 0 AREA (SF) X 0.65 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

METAL ROLL UP DOORS = 1792 AREA (SF) X 0.56 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR

WOOD GLAZED O'HEAD DR = 0 AREA (SF) X 0.214 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

LG MTL SLIDING DOOR = 0 AREA (SF) X 0.56 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

METAL PERSONNEL DR = 0 AREA (SF) X 0.56 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

MTL/ GLAZED PERSONNEL = 50 AREA (SF) X 0.615 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

### TOTAL ECO HEAT LOSSES

= 0.39 MBTU / HR  
= 406.30 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

SYSTEM EFFICIENCY	BASELINE	ECO - 1
OUTSIDE DESIGN TEMP (F)	60%	90%
HTG TEMP SETPOINT (F)	1	1
HEATING DEGREE DAYS	60	55
TOTAL HEAT LOSSES	4616	3396
(MBTU / HR)	0.42	0.39
\$ /MBTU - FUEL OIL	\$6.60	\$6.60
\$ /MBTU - NATURAL GAS	\$4.62	\$4.62
\$ /MBTU -PPG	\$10.84	\$10.84

BUILDING NUMBER 6145

### GLOSSARY OF TERMS

1 MBTU = 1055 MJ  
 0.019=CONSTANT  
 .81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE  
 CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS  
 65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.42	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	1,316.82	MBTU/YR
	0.6	SYS EFF	X	59	TEMP DIFFERENCE						
	1,316.82	MBTU/YR		X	CORR FACTOR		1				
ECO - 1 =	0.39	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	645.86	MBTU/YR
	0.9	SYS EFF	X	54	TEMP DIFFERENCE						
	645.86	MBTU/YR		X	CORR FACTOR		1				
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS											
									=	670.96	MBTU/YR
									=	707,867.19	MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	1,316.82	MBTU / YR	X	6.6	\$ /MBTU	=	8,691.04	\$ /YR
ECO - 1 =	645.86	MBTU / YR	X	4.62	\$ /MBTU	=	2,983.87	\$ /YR
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# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 1 OF 3

BUILDING NUMBER: 6146 BUILDING HEATING TEMPERATURE SETPOINT: 60 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 59 F

INFILTRATION LOSSES = 1 AIR CHGS X 138900 VOL (CU FT) X 59 F TEMP DIFF X 0.019 = 0.16 MBTU / HR  
FLOOR LOSSES = 390 LINEAR FEET OF PERIMETER X 59 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	8100	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2743	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
CORR MTL PNL WALL =	1685	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.02	MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
TINTED DBL PANE WIN"W =		AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =	1792	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
METAL GLAZED O'HEAD DR =		AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL=	50	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

TOTAL BASELINE HEAT LOSSES = 0.42 MBTU / HR  
= 443.92 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 6146		BUILDING HEATING TEMPERATURE SETPOINT: 55 F			
		OUTSIDE DESIGN TEMPERATURE 1 F			
		TEMPERATURE DIFFERENCE 54 F			
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FLAT BUILT UP ROOF =	8100	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE =	0.05 MBTU / HR
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WOOD GLAZED O'HEAD DR =	0	AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE =	0.00 MBTU / HR
LG MTL SLIDING DOOR =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE =	0.00 MBTU / HR
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MTL/GLAZED PERSONNEL =	50	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE =	0.00 MBTU / HR
TOTAL ECO HEAT LOSSES				=	0.39 MBTU / HR
				=	406.30 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

BUILDING NUMBER	6146	GLOSSARY OF TERMS
1 MBTU = 1055 MJ		
0.019=CONSTANT		
.81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE		
CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS		
65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2		

	BASELINE	ECO - 1
SYSTEM EFFICIENCY	60%	90%
OUTSIDE DESIGN TEMP (F)	1	55
HTG TEMP SETPOINT (F)	60	3396
HEATING DEGREE DAYS	4616	0.39
TOTAL HEAT LOSSES (MBTU / HR)	0.42	\$6.60
\$ /MBTU -FUEL OIL	\$6.60	\$4.62
\$ /MBTU -NATURAL GAS	\$4.62	\$10.84
\$ /MBTU -PPG	\$10.84	

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.42	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	1,316.82	MBTU/YR
	0.6	SYS EFF	X	59	TEMP DIFFERENCE						
ECO - 1 =	1,316.82	MBTU/YR	X		CORR FACTOR		1		=	1,316.82	MBTU/YR
	0.39	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	645.86	MBTU/YR
	0.9	SYS EFF	X	54	TEMP DIFFERENCE						
	645.86	MBTU/YR	X		CORR FACTOR		1		=	645.86	MBTU/YR
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS	=								=	670.96	MBTU/YR
										707,867.19	MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	1,316.82	MBTU / YR	X	6.6	\$ /MBTU	=	8,691.04	\$ /YR
ECO - 1 =	645.86	MBTU / YR	X	4.62	\$ /MBTU	=	2,983.87	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS	=					=	5,707.17	\$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 1 OF 3

BUILDING NUMBER: 6147

BUILDING HEATING TEMPERATURE SETPOINT: 60 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 59 F

INFILTRATION LOSSES = 1 AIR CHGS X 138900 VOL (CU FT) X 59 F TEMP DIFF X 0.019 = 0.16 MBTU / HR  
FLOOR LOSSES = 390 LINEAR FEET OF PERIMETER X 59 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	8100	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2743	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
CORR MTL PNL WALL =	1685	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.02	MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
TINTED DBL PANE WIN'W =		AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =	1792	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
METAL GLAZED O'HEAD DR =		AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/GLAZED PERSONNEL =	50	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL BASELINE HEAT LOSSES

= 0.42 MBTU / HR  
= 443.92 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 6147 BUILDING HEATING TEMPERATURE SETPOINT: 55 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 54 F

INFILTRATION LOSSES = 1 AIR CHGS X 138900 VOL (CU FT) X 54 F TEMP DIFF X 0.019 = 0.14 MBTU / HR

FLOOR LOSSES = 390 LINEAR FEET OF PERIMETER X 54 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	8100	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
FACE BRICK/BLK WALL =	0	AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2743	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
CORR MTL PNL WALL =	1685	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.02	MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
TINTED DBL PANE WIN'W =	0	AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =	1792	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
WOOD GLAZED O'HEAD DR =	0	AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
LG MTL SLIDING DOOR =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL =	50	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL ECO HEAT LOSSES

= 0.39 MBTU / HR  
= 406.30 MJ/HR

## ECO - 1: INFRARED HEATING CALCULATIONS

**PAGE 3 OF 3**

	BUILDING NUMBER	6147
	GLOSSARY OF TERMS	
	1 MBTU = 1055 MJ	
	0.019=CONSTANT	
	.81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE	
	CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS	
	65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2	

**ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)**

[illegible]

## ANNUAL HEATING ENERGY COST

BASELINE =	1,316.82	MBTU / YR X	6.6	\$ /MBTU	=	8,691.04	\$ /YR
ECO - 1 =	645.86	MBTU / YR X	4.62	\$ /MBTU	=	2,983.87	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS =							5,707.17 \$ /YR

LIFE CYCLE COST ANALYSIS SUMMARY

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)      STUDY; 6560ECO1  
 INSTALLATION & LOCATION: FORT KNOX      REGION NOS. 4      LCCID 1.080  
 PROJECT NO. & TITLE: 6560ECO1      ECO-1 INFRARED HEAT  
 FISCAL YEAR 95      DISCRETE PORTION NAME: INFRARED  
 ANALYSIS DATE: 10-18-94      ECONOMIC LIFE 20 YEARS PREPARED BY: JAH

1. INVESTMENT

A. CONSTRUCTION COST	\$	239399.	
B. SIOH	\$	11970.	
C. DESIGN COST	\$	11970.	
D. TOTAL COST (1A+1B+1C)	\$	263339.	
E. SALVAGE VALUE OF EXISTING EQUIPMENT	\$	0.	
F. PUBLIC UTILITY COMPANY REBATE	\$	0.	
G. TOTAL INVESTMENT (1D - 1E - 1F)	\$		263339.

2. ENERGY SAVINGS (+) / COST (-)

DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTORS OCT 1993

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ .00	0.	\$ 0.	15.61	\$ 0.
B. DIST	\$ 6.60	6569.	\$ 43357.	17.56	\$ 761356.
C. RESID	\$ .00	0.	\$ 0.	19.97	\$ 0.
D. NAT G	\$ 4.62	-3222.	\$ -14886.	20.96	\$ -312006.
E. COAL	\$ .00	0.	\$ 0.	17.58	\$ 0.
F. LPG	\$ .00	0.	\$ 0.	16.12	\$ 0.
M. DEMAND SAVINGS			\$ 0.	14.74	\$ 0.
N. TOTAL		3347.	\$ 28472.		\$ 449350.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)

(1) DISCOUNT FACTOR (TABLE A)	14.74	\$ 2970.
(2) DISCOUNTED SAVING/COST (3A X 3A1)		\$ 43778.

B. NON RECURRING SAVINGS(+) / COSTS(-)

ITEM	SAVINGS(+) / COST(-) (1)	YR OC (2)	DISCNT FACTR (3)	DISCOUNTED SAVINGS(+) / COST(-) (4)
1. REPAIR	\$ 19073.	5	.86	16402.
2. REPAIR2	\$ 19073.	15	.63	12016.
3. REPAIR3	\$ 2727.	7	.81	2209.
4. REPAIR4	\$ 2727.	14	.65	1773.
5. ENVIR	\$ 64738.	3	.91	58912.
d. TOTAL	\$ 108338.			91312.

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+) / COST(-) (3A2+3Bd4) \$ 135089.

4. FIRST YEAR DOLLAR SAVINGS  $2N3+3A+(3Bd1/(YRS \text{ ECONOMIC LIFE}))$  \$ 36858.

5. SIMPLE PAYBACK PERIOD (1G/4) 7.14 YEARS

6. TOTAL NET DISCOUNTED SAVINGS (2N5+3C) \$ 584439.

7. SAVINGS TO INVESTMENT RATIO (SIR) = (6 / 1G) = 2.22  
 (IF < 1 PROJECT DOES NOT QUALIFY)

8. ADJUSTED INTERNAL RATE OF RETURN (AIRR): 7.29 %

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=====
Estimate:      65XX AREA          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:      LIMITED EEAP(GLASS Bid Date:
Location:     FORT KNOX, KY      Job #:      94013.02
Sq. footage:  MAIN GAS LINE      City indx: Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205542200	SITE DEMOLITION, PAVEMENT, CONCRETE, TO 24" THICK, REINFORCED					111.00 C.Y.	
Unit values	4.21	0.00	92.52	133.64	0.00		226.16
Totals	467.42	\$0	\$10,270	\$14,834	\$0		\$25,104
0222541900	TAMPING TRENCH B'FILL, VIBRATING PLATE, ADD					111.00 C.Y.	
Unit values	0.09	0.00	1.74	0.67	0.00		2.41
Totals	9.88	\$0	\$193	\$74	\$0		\$267
0222582800	TRENCH EXCVTNG 40HP CHNTRNCHR&BKFL 12"W24"D					1500.00 L.F.	
Unit values	0.01	0.00	0.24	0.24	0.00		0.47
Totals	15.00	\$0	\$355	\$355	\$0		\$710
0251200400	CONCRETE PAVING, JOINTS/FINISH, 4500 PSI CONCRETE, 12" THICK					167.00 S.Y.	
Unit values	0.05	17.52	1.07	1.02	0.00		19.61
Totals	8.18	\$2,926	\$179	\$170	\$0		\$3,275
0260120200	BEDDING, FOR PIPE IN TRENCH SAND, DEAD OR BANK					28.00 C.Y.	
Unit values	0.16	2.43	3.37	1.37	0.00		7.17
Totals	4.48	\$68	\$94	\$38	\$0		\$200
0260120500	BEDDING, PLACING IN TRENCH					28.00 C.Y.	
Unit values	0.09	0.00	1.74	0.67	0.00		2.41
Totals	2.49	\$0	\$49	\$19	\$0		\$68
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values	1.56	259.60	35.47	5.91	0.00		300.98
Totals	1.56	\$260	\$35	\$6	\$0		\$301
0268520200	GAS SERVICE & DISTRIB PIPING, POLYETHYLENE, 60- PSI 2" DIAM COIL SDR 11					1500.00 L.F.	
Unit values	0.07	0.75	1.48	0.00	0.00		2.23
Totals	100.50	\$1,129	\$2,220	\$0	\$0		\$3,349

18-Oct-94

MeansData for Lotus

Page 2

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=====
Line #      Description
-----
              Manhours   Matl      Labor    Equipment   Sub      Total
=====
U02 SITEWORK      610      $4,383   $13,395   $15,496      $0    $33,274
1562600139      GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
                TYPE 2" PIPE SIZE
Unit values      0.73      420.00     16.42      0.00      0.00    436.42
Totals           0.73      $420      $16        $0        $0      $436

U15 MECHANICAL      1      $420      $16        $0        $0      $436
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=====
Line #      Description
-----
              Manhours   Matl      Labor    Equipment   Sub      Total
=====
```

ESTIMATE TOTAL	611	\$4,803	\$13,411	\$15,496	\$0	\$33,710
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$4,803	\$13,411	\$15,496	\$0	\$33,710
CONTINGENCY	10.00%					\$3,371
BOND	0.00%					\$0
PROFIT	10.00%					\$3,371
JOB TOTAL						\$40,452

```

=====
Estimate:      65XX AREA          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   MAIN GAS LINE      City indx:Louisville, KY
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SUMMARY

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	Manhours	Matl	Labor	Equipment	Sub	Total
U02 SITEWORK	610	\$4,383	\$13,395	\$15,496	\$0	\$33,274
U15 MECHANICAL	1	\$420	\$16	\$0	\$0	\$436
TOTAL	611	\$4,803	\$13,411	\$15,496	\$0	\$33,710
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$4,803	\$13,411	\$15,496	\$0	\$33,710
CONTINGENCY	10.00%					\$3,371
BOND	0.00%					\$0
PROFIT	10.00%					\$3,371
JOB TOTAL						\$40,452

```

=====
Estimate:      BLDG 6560          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    4800.00          City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					400.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		60.00	\$0	\$1,262	\$514	\$0	\$1,776
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.50 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		7.27	\$0	\$190	\$0	\$0	\$190
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					200.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		14.20	\$0	\$395	\$47	\$0	\$442
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					100.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		20.00	\$0	\$555	\$68	\$0	\$623
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		109	\$356	\$2,585	\$644	\$0	\$3,585

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=====
Line #      Description
-----
              Manhours  Matl    Labor  Equipment  Sub    Total
=====
1554510245   HTG INFA-RD UNT GAS ELEC IGN (See Attached for Breakdown)
              0.00      0.00    0.00    0.00    1.00 LS.
Unit values   0.00      0.00    0.00    0.00  18822.00  18822.00
Totals        0.00      $0      $0      $0    $18,822  $18,822

1562600137   GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
              TYPE 1-1/4" PIPE SIZE
Unit values   0.53     226.00   12.10    0.00    0.00 Ea.  238.10
Totals        0.53     $226    $12      $0      $0      $238

U15 MECHANICAL      1      $226      $12      $0    $18,822  $19,060

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=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub      Total
=====
```

ESTIMATE TOTAL	110	\$582	\$2,597	\$644	\$18,822	\$22,645
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$582	\$2,597	\$644	\$18,822	\$22,645
CONTINGENCY	10.00%					\$2,265
BOND	0.00%					\$0
PROFIT	10.00%					\$2,265
JOB TOTAL						\$27,174

```

=====
Estimate:      BLDG 6560           Date:      14-Oct-94
Description:   COST ESTIMATE
Project:      LIMITED EEAP (GLASS Bid Date:
Location:     FORT KNOX, KY       Job #:      94013.02
Sq. footage:  4800.00           City indx: Louisville, KY
=====

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## SUMMARY

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=====
              Manhours   Matl      Labor    Equipment    Sub      Total
=====
U02 SITEWORK      109      $356     $2,585      $644        $0      $3,585
U15 MECHANICAL     1      $226       $12        $0      $18,822    $19,060
TOTAL             110      $582     $2,597      $644      $18,822    $22,645

SALES TAX         0.00%       $0
MATL MARKUP       0.00%       $0
LABOR MARKUP      0.00%      $0
EQUIPT MARKUP     0.00%      $0
SUB MARKUP        0.00%      $0

TOTAL BEFORE CONTINGENC $582     $2,597      $644      $18,822    $22,645
CONTINGENCY       10.00%      $2,265
BOND              0.00%       $0
PROFIT           10.00%      $2,265
JOB TOTAL                                     $27,174
=====

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=====
Estimate:      BLDG 6560           Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED BEAP (GLASS Bid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    City indx: Louisville, KY
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Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					300.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		44.70	\$665	\$1,372	\$0	\$0	\$2,037
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					50.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		7.45	\$111	\$229	\$0	\$0	\$340
A09 ELECTRICAL		53	\$776	\$1,601	\$0	\$0	\$2,377

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS 275.00 L.F.						
Unit values	0.44	4.17	10.30	0.00	0.00		14.47
Totals	122.10	\$1,147	\$2,833	\$0	\$0		\$3,980
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNCR SZD FOR CVRG 10' OC 1/2" DIAM 330.00 L.F.						
Unit values	0.13	1.64	2.88	0.00	0.00		4.52
Totals	41.91	\$541	\$949	\$0	\$0		\$1,490
1519010320	ALUMINUM REFLECTORS W/HANGERS 38.00 Ea.						
Unit values	0.50	39.79	3.80	0.00	0.00		43.59
Totals	19.00	\$1,512	\$145	\$0	\$0		\$1,657
1524105040	VACUUM PUMP AND VENT PIPING 1.00 Ea.						
Unit values	3.00	738.35	120.15	0.00	0.00		858.50
Totals	3.00	\$738	\$120	\$0	\$0		\$858
1552301020	CRV-100 GAS FIRED BURNER, 100 MBH & COMBUSTION CHAMBER 6.00 Ea.						
Unit values	1.00	860.00	44.06	0.00	0.00		904.06
Totals	6.00	\$5,160	\$264	\$0	\$0		\$5,424
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH 2.00 Ea.						
Unit values	4.00	935.00	81.70	0.00	0.00		1016.70
Totals	8.00	\$1,870	\$163	\$0	\$0		\$2,033
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE 2.00 Ea.						
Unit values	1.60	70.00	76.50	0.00	0.00		146.50
Totals	3.20	\$140	\$153	\$0	\$0		\$293
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING 3.00 Ea.						
Unit values	1.00	75.00	27.55	0.00	0.00		102.55
Totals	3.00	\$225	\$83	\$0	\$0		\$308
U15 MECHANICAL	207	\$11,333	\$4,710	\$0	\$0		\$16,043

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=====
Line #      Description
-----
              Manhours   Matl      Labor   Equipment   Sub      Total
=====

1631200100   HEATING SYSTEM POWER / CONTROL PANEL
              2.96      330.76    70.58      0.00      1.00 Ea.
Unit values              2.96      330.76    70.58      0.00      0.00      401.34
Totals              2.96      $331      $71      $0      $0      $402

U16 ELECTRICAL      3      $331      $71      $0      $0      $402
```

```
=====
Line #      Description
-----
           Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	263	\$12,440	\$6,382	\$0	\$0	\$18,822
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$12,440	\$6,382	\$0	\$0	\$18,822
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$18,822

```

=====
Estimate:      BLDG 6560      Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

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## SUMMARY

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=====
              Manhours   Matl      Labor   Equipment   Sub      Total
=====
A09 ELECTRICAL      53      $776      $1,601      $0      $0      $2,377
U15 MECHANICAL     207     $11,333      $4,710      $0      $0     $16,043
U16 ELECTRICAL       3      $331      $71        $0      $0      $402

TOTAL              263     $12,440      $6,382      $0      $0     $18,822

SALES TAX           0.00%      $0
MATL MARKUP         0.00%      $0
LABOR MARKUP        0.00%      $0
EQUIPT MARKUP       0.00%      $0
SUB MARKUP          0.00%      $0

TOTAL BEFORE CONTINGENC $12,440      $6,382      $0      $0     $18,822
CONTINGENCY          0.00%
BOND                 0.00%
PROFIT               0.00%

JOB TOTAL                                           $18,822
=====

```

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=====
Estimate:      BLDG 6561      Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    4800.00      City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					400.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		60.00	\$0	\$1,262	\$514	\$0	\$1,776
0207180380	HVAC DEMO, BOILER GAS/OIL STL >150MBH					1.00 Ea.	
Unit values		12.00	0.00	323.82	0.00	0.00	323.82
Totals		12.00	\$0	\$324	\$0	\$0	\$324
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.50 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		7.27	\$0	\$190	\$0	\$0	\$190
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					200.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		14.20	\$0	\$395	\$47	\$0	\$442
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					100.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		20.00	\$0	\$555	\$68	\$0	\$623
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		121	\$356	\$2,909	\$644	\$0	\$3,909

```
=====
Line #      Description
-----
              Manhours  Matl    Labor  Equipment  Sub    Total
=====

1554510245   HTG INFA-RD UNT GAS ELEC IGN (See Attached for Breakdown)
              0.00      0.00    0.00    0.00    1.00 LS.
Unit values   0.00      0.00    0.00    0.00  18822.00  18822.00
Totals        0.00      $0      $0      $0    $18,822  $18,822

1562600137   GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
              0.53    226.00   12.10    0.00    1.00 Ea.
Unit values   0.53    226.00   12.10    0.00    0.00    238.10
Totals        0.53    $226     $12      $0      $0      $238

U15 MECHANICAL      1      $226     $12      $0    $18,822  $19,060
=====
```

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	122	\$582	\$2,921	\$644	\$18,822	\$22,969
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$582	\$2,921	\$644	\$18,822	\$22,969
CONTINGENCY	10.00%					\$2,297
BOND	0.00%					\$0
PROFIT	10.00%					\$2,297
JOB TOTAL						\$27,563

```

=====
Estimate:      BLDG 6561          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    4800.00          City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
Manhours  Matl    Labor  Equipment  Sub    Total
=====
U02 SITEWORK      121    $356    $2,909    $644    $0    $3,909
U15 MECHANICAL     1    $226     $12     $0    $18,822  $19,060
TOTAL             122    $582    $2,921    $644    $18,822  $22,969

SALES TAX          0.00%    $0
MATL MARKUP        0.00%    $0
LABOR MARKUP       0.00%    $0
EQUIPT MARKUP      0.00%    $0
SUB MARKUP         0.00%    $0

TOTAL BEFORE CONTINGENC  $582    $2,921    $644    $18,822  $22,969
CONTINGENCY         10.00%    $2,297
BOND                 0.00%    $0
PROFIT              10.00%    $2,297

JOB TOTAL                                     $27,563
=====

```

```

=====
Estimate:      BLDG 6561          Date:      14-Oct-94
Description:   INFRARED HEATING SYSTEM COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY      Job #:      94013.02
Sq. footage:   City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					300.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		44.70	\$665	\$1,372	\$0	\$0	\$2,037
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					50.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		7.45	\$111	\$229	\$0	\$0	\$340
A09 ELECTRICAL		53	\$776	\$1,601	\$0	\$0	\$2,377

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					275.00 L.F.	
Unit values	0.44	4.17	10.30	0.00	0.00		14.47
Totals	122.10	\$1,147	\$2,833	\$0	\$0		\$3,980
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNCR SZD FOR CVRG 10'OC 1/2" DIAM					330.00 L.F.	
Unit values	0.13	1.64	2.88	0.00	0.00		4.52
Totals	41.91	\$541	\$949	\$0	\$0		\$1,490
1519010320	ALUMINUM REFLECTORS W/HANGERS					38.00 Ea.	
Unit values	0.50	39.79	3.80	0.00	0.00		43.59
Totals	19.00	\$1,512	\$145	\$0	\$0		\$1,657
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.	
Unit values	3.00	738.35	120.15	0.00	0.00		858.50
Totals	3.00	\$738	\$120	\$0	\$0		\$858
1552301020	CRV-100 GAS FIRED BURNER, 100 MBH & COMBUSTION CHAMBER					6.00 Ea.	
Unit values	1.00	860.00	44.06	0.00	0.00		904.06
Totals	6.00	\$5,160	\$264	\$0	\$0		\$5,424
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH					2.00 Ea.	
Unit values	4.00	935.00	81.70	0.00	0.00		1016.70
Totals	8.00	\$1,870	\$163	\$0	\$0		\$2,033
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					2.00 Ea.	
Unit values	1.60	70.00	76.50	0.00	0.00		146.50
Totals	3.20	\$140	\$153	\$0	\$0		\$293
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					3.00 Ea.	
Unit values	1.00	75.00	27.55	0.00	0.00		102.55
Totals	3.00	\$225	\$83	\$0	\$0		\$308
U15 MECHANICAL		207	\$11,333	\$4,710	\$0	\$0	\$16,043

```
=====
Line #      Description
-----
           Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

1631200100      HEATING SYSTEM POWER / CONTROL PANEL

					1.00 Ea.	
Unit values	2.96	330.76	70.58	0.00	0.00	401.34
Totals	2.96	\$331	\$71	\$0	\$0	\$402

U16 ELECTRICAL	3	\$331	\$71	\$0	\$0	\$402
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```
=====
Line #      Description
-----
           Manhours   Matl     Labor   Equipment   Sub     Total
=====
```

ESTIMATE TOTAL	263	\$12,440	\$6,382	\$0	\$0	\$18,822
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$12,440	\$6,382	\$0	\$0	\$18,822
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$18,822

```

=====
Estimate:      BLDG 6561      Date:      14-Oct-94
Description:   INFRARED HEATING SYSTEM COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY   Job #:      94013.02
Sq. footage:   City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
A09 ELECTRICAL      53      $776      $1,601      $0      $0      $2,377
U15 MECHANICAL     207     $11,333      $4,710      $0      $0     $16,043
U16 ELECTRICAL       3      $331        $71        $0      $0      $402
TOTAL              263     $12,440      $6,382      $0      $0     $18,822

SALES TAX           0.00%          $0
MATL MARKUP         0.00%          $0
LABOR MARKUP        0.00%          $0
EQUIPT MARKUP       0.00%          $0
SUB MARKUP          0.00%          $0

TOTAL BEFORE CONTINGENC $12,440      $6,382      $0      $0     $18,822
CONTINGENCY          0.00%          $0
BOND                 0.00%          $0
PROFIT               0.00%          $0

JOB TOTAL                                $18,822
=====

```

```

=====
Estimate:      BLDG 6562          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    4800.00          City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					400.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		60.00	\$0	\$1,262	\$514	\$0	\$1,776
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.50 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		7.27	\$0	\$190	\$0	\$0	\$190
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					200.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		14.20	\$0	\$395	\$47	\$0	\$442
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					100.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		20.00	\$0	\$555	\$68	\$0	\$623
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		109	\$356	\$2,585	\$644	\$0	\$3,585



```
=====
Line #      Description
-----
           Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	110	\$582	\$2,597	\$644	\$18,822	\$22,645
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$582	\$2,597	\$644	\$18,822	\$22,645
CONTINGENCY	10.00%					\$2,265
BOND	0.00%					\$0
PROFIT	10.00%					\$2,265
JOB TOTAL						\$27,174

```

=====
Estimate:      BLDG 6562          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   4800.00           City indx:Louisville, KY
=====

```

## SUMMARY

```

-----
              Manhours   Matl      Labor   Equipment   Sub      Total
=====
U02 SITEWORK      109      $356    $2,585      $644        $0    $3,585
U15 MECHANICAL      1      $226      $12        $0    $18,822    $19,060
TOTAL              110      $582    $2,597      $644    $18,822    $22,645

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC  $582    $2,597      $644    $18,822    $22,645
CONTINGENCY        10.00%      $2,265
BOND               0.00%      $0
PROFIT            10.00%      $2,265
JOB TOTAL                                $27,174

```

```

=====
Estimate:      BLDG 6562           Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					300.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		44.70	\$665	\$1,372	\$0	\$0	\$2,037
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					50.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		7.45	\$111	\$229	\$0	\$0	\$340
A09 ELECTRICAL		53	\$776	\$1,601	\$0	\$0	\$2,377

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					275.00 L.F.	
Unit values		0.44	4.17	10.30	0.00	0.00	14.47
Totals		122.10	\$1,147	\$2,833	\$0	\$0	\$3,980
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNGR SZD FOR CVRG 10' OC 1/2" DIAM					330.00 L.F.	
Unit values		0.13	1.64	2.88	0.00	0.00	4.52
Totals		41.91	\$541	\$949	\$0	\$0	\$1,490
1519010320	ALUMINUM REFLECTORS W/HANGERS					38.00 Ea.	
Unit values		0.50	39.79	3.80	0.00	0.00	43.59
Totals		19.00	\$1,512	\$145	\$0	\$0	\$1,657
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.	
Unit values		3.00	738.35	120.15	0.00	0.00	858.50
Totals		3.00	\$738	\$120	\$0	\$0	\$858
1552301020	CRV-100 GAS FIRED BURNER, 100 MBH & COMBUSTION CHAMBER					6.00 Ea.	
Unit values		1.00	860.00	44.06	0.00	0.00	904.06
Totals		6.00	\$5,160	\$264	\$0	\$0	\$5,424
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH					2.00 Ea.	
Unit values		4.00	935.00	81.70	0.00	0.00	1016.70
Totals		8.00	\$1,870	\$163	\$0	\$0	\$2,033
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					2.00 Ea.	
Unit values		1.60	70.00	76.50	0.00	0.00	146.50
Totals		3.20	\$140	\$153	\$0	\$0	\$293
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					3.00 Ea.	
Unit values		1.00	75.00	27.55	0.00	0.00	102.55
Totals		3.00	\$225	\$83	\$0	\$0	\$308
U15 MECHANICAL		207	\$11,333	\$4,710	\$0	\$0	\$16,043

```
=====
Line #      Description
-----
           Manhours  Matl    Labor  Equipment  Sub    Total
=====

1631200100  HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58    0.00    1.00 Ea.    401.34
Totals           2.96    $331      $71      $0      $0      $402

U16 ELECTRICAL      3      $331      $71      $0      $0      $402
```

```
=====
Line #      Description
-----
      Manhours   Matl    Labor   Equipment   Sub    Total
=====
```

ESTIMATE TOTAL	263	\$12,440	\$6,382	\$0	\$0	\$18,822
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$12,440	\$6,382	\$0	\$0	\$18,822
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$18,822

```

=====
Estimate:      BLDG 6562      Date:      14-Oct-94
Description:   INFRARED HEATING SYSTEM COST ESTIMATE
Project:      LIMITED EEAP(GLASSBid Date:
Location:     FORT KNOX, KY   Job #:      94013.02
Sq. footage:  City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
A09 ELECTRICAL      53      $776      $1,601      $0      $0      $2,377
U15 MECHANICAL     207     $11,333     $4,710      $0      $0     $16,043
U16 ELECTRICAL       3      $331       $71        $0      $0      $402
TOTAL              263     $12,440     $6,382      $0      $0     $18,822

SALES TAX           0.00%      $0
MATL MARKUP         0.00%      $0
LABOR MARKUP        0.00%      $0
EQUIPT MARKUP       0.00%      $0
SUB MARKUP          0.00%      $0

TOTAL BEFORE CONTINGENC $12,440     $6,382      $0      $0     $18,822
CONTINGENCY          0.00%      $0
BOND                 0.00%      $0
PROFIT               0.00%      $0

JOB TOTAL                                           $18,822
=====

```

```

=====
Estimate:      BLDG 6563          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP (GLASS Bid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    4800.00          City indx: Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					400.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		60.00	\$0	\$1,262	\$514	\$0	\$1,776
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.50 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		7.27	\$0	\$190	\$0	\$0	\$190
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					200.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		14.20	\$0	\$395	\$47	\$0	\$442
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					100.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		20.00	\$0	\$555	\$68	\$0	\$623
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE & DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT & WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		109	\$356	\$2,585	\$644	\$0	\$3,585

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1554510245	HTG INFA-RD UNT GAS ELEC IGN (See Attached for Breakdown)						
	1.00 LS.						
Unit values	0.00	0.00	0.00	0.00	18822.00	18822.00	
Totals	0.00	\$0	\$0	\$0	\$18,822	\$18,822	
1562600137	GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM						
	TYPE 1-1/4" PIPE SIZE						
	1.00 Ea.						
Unit values	0.53	226.00	12.10	0.00	0.00	238.10	
Totals	0.53	\$226	\$12	\$0	\$0	\$238	
U15 MECHANICAL	1	\$226	\$12	\$0	\$18,822	\$19,060	

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	110	\$582	\$2,597	\$644	\$18,822	\$22,645
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$582	\$2,597	\$644	\$18,822	\$22,645
CONTINGENCY	10.00%					\$2,265
BOND	0.00%					\$0
PROFIT	10.00%					\$2,265
JOB TOTAL						\$27,174

```

=====
Estimate:      BLDG 6563           Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED BEAP (GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    4800.00           City indx: Louisville, KY
=====

```

## SUMMARY

```

=====
              Manhours   Matl      Labor   Equipment   Sub      Total
=====
U02 SITEWORK      109      $356    $2,585     $644        $0    $3,585
U15 MECHANICAL      1      $226      $12        $0    $18,822    $19,060
TOTAL              110      $582    $2,597     $644    $18,822    $22,645

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC  $582    $2,597     $644    $18,822    $22,645
CONTINGENCY        10.00%      $2,265
BOND               0.00%      $0
PROFIT            10.00%      $2,265
JOB TOTAL                                $27,174
=====

```

```

=====
Estimate:      BLDG 6563      Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY   Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					300.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		44.70	\$665	\$1,372	\$0	\$0	\$2,037
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					50.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		7.45	\$111	\$229	\$0	\$0	\$340
A09 ELECTRICAL		53	\$776	\$1,601	\$0	\$0	\$2,377

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS 275.00 L.F.						
Unit values	0.44	4.17	10.30	0.00	0.00		14.47
Totals	122.10	\$1,147	\$2,833	\$0	\$0		\$3,980
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNGR SZD FOR CVRG 10' OC 1/2" DIAM 330.00 L.F.						
Unit values	0.13	1.64	2.88	0.00	0.00		4.52
Totals	41.91	\$541	\$949	\$0	\$0		\$1,490
1519010320	ALUMINUM REFLECTORS W/HANGERS 38.00 Ea.						
Unit values	0.50	39.79	3.80	0.00	0.00		43.59
Totals	19.00	\$1,512	\$145	\$0	\$0		\$1,657
1524105040	VACUUM PUMP AND VENT PIPING 1.00 Ea.						
Unit values	3.00	738.35	120.15	0.00	0.00		858.50
Totals	3.00	\$738	\$120	\$0	\$0		\$858
1552301020	CRV-100 GAS FIRED BURNER, 100 MBH & COMBUSTION CHAMBER 6.00 Ea.						
Unit values	1.00	860.00	44.06	0.00	0.00		904.06
Totals	6.00	\$5,160	\$264	\$0	\$0		\$5,424
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH 2.00 Ea.						
Unit values	4.00	935.00	81.70	0.00	0.00		1016.70
Totals	8.00	\$1,870	\$163	\$0	\$0		\$2,033
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE 2.00 Ea.						
Unit values	1.60	70.00	76.50	0.00	0.00		146.50
Totals	3.20	\$140	\$153	\$0	\$0		\$293
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING 3.00 Ea.						
Unit values	1.00	75.00	27.55	0.00	0.00		102.55
Totals	3.00	\$225	\$83	\$0	\$0		\$308
U15 MECHANICAL		207	\$11,333	\$4,710	\$0	\$0	\$16,043

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

1631200100      HEATING SYSTEM POWER / CONTROL PANEL

					1.00 Ea.	
Unit values	2.96	330.76	70.58	0.00	0.00	401.34
Totals	2.96	\$331	\$71	\$0	\$0	\$402

U16 ELECTRICAL	3	\$331	\$71	\$0	\$0	\$402
----------------	---	-------	------	-----	-----	-------

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
ESTIMATE TOTAL		263	\$12,440	\$6,382	\$0	\$0	\$18,822
SALES TAX	0.00%		\$0				
MATL MARKUP	0.00%		\$0				
LABOR MARKUP	0.00%			\$0			
EQUIPT MARKUP	0.00%				\$0		
SUB MARKUP	0.00%					\$0	
TOTAL BEFORE CONTINGENC			\$12,440	\$6,382	\$0	\$0	\$18,822
CONTINGENCY	0.00%						\$0
BOND	0.00%						\$0
PROFIT	0.00%						\$0
JOB TOTAL							\$18,822

```

=====
Estimate:      BLDG 6563      Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY   Job #:      94013.02
Sq. footage:   City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
A09 ELECTRICAL      53      $776      $1,601      $0      $0      $2,377
U15 MECHANICAL     207     $11,333      $4,710      $0      $0     $16,043
U16 ELECTRICAL       3      $331       $71      $0      $0      $402
TOTAL              263     $12,440      $6,382      $0      $0     $18,822

SALES TAX           0.00%      $0
MATL MARKUP         0.00%      $0
LABOR MARKUP        0.00%      $0
EQUIPT MARKUP       0.00%      $0
SUB MARKUP          0.00%      $0

TOTAL BEFORE CONTINGENC $12,440      $6,382      $0      $0     $18,822
CONTINGENCY          0.00%      $0
BOND                 0.00%      $0
PROFIT               0.00%      $0

JOB TOTAL                                     $18,822
=====

```

```

=====
Estimate:      BLDG 6564      Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP (GLASS
Location:       FORT KNOX, KY   Job #:      94013.02
Sq. footage:    4800.00      City indx: Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					400.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		60.00	\$0	\$1,262	\$514	\$0	\$1,776
0207180380	HVAC DEMO, BOILER GAS/OIL STL >150MBH					1.00 Ea.	
Unit values		12.00	0.00	323.82	0.00	0.00	323.82
Totals		12.00	\$0	\$324	\$0	\$0	\$324
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.50 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		7.27	\$0	\$190	\$0	\$0	\$190
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					200.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		14.20	\$0	\$395	\$47	\$0	\$442
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					100.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		20.00	\$0	\$555	\$68	\$0	\$623
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE & DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT & WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		121	\$356	\$2,909	\$644	\$0	\$3,909

```
=====
Line #      Description
-----
              Manhours   Matl      Labor   Equipment   Sub      Total
=====

1554510245   HTG INFA-RD UNT GAS ELEC IGN (See Attached for Breakdown)
                                     1.00 LS.
Unit values      0.00      0.00      0.00      0.00  18822.00  18822.00
Totals           0.00      $0        $0        $0    $18,822   $18,822

1562600137   GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
              TYPE 1-1/4" PIPE SIZE
Unit values      0.53     226.00     12.10      0.00      0.00    238.10
Totals           0.53     $226      $12        $0        $0      $238

U15 MECHANICAL      1      $226      $12        $0    $18,822   $19,060
=====
```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
ESTIMATE TOTAL		122	\$582	\$2,921	\$644	\$18,822	\$22,969
SALES TAX	0.00%		\$0				
MATL MARKUP	0.00%		\$0				
LABOR MARKUP	0.00%			\$0			
EQUIPT MARKUP	0.00%				\$0		
SUB MARKUP	0.00%					\$0	
TOTAL BEFORE CONTINGENC			\$582	\$2,921	\$644	\$18,822	\$22,969
CONTINGENCY	10.00%						\$2,297
BOND	0.00%						\$0
PROFIT	10.00%						\$2,297
JOB TOTAL							\$27,563

```

=====
Estimate:      BLDG 6564          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   4800.00           City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
              Manhours  Matl    Labor  Equipment  Sub    Total
=====
U02 SITEWORK      121      $356    $2,909    $644      $0    $3,909
U15 MECHANICAL     1      $226     $12      $0      $18,822  $19,060
TOTAL             122      $582    $2,921    $644      $18,822  $22,969

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC  $582    $2,921    $644    $18,822  $22,969
CONTINGENCY        10.00%      $2,297
BOND               0.00%      $0
PROFIT            10.00%      $2,297
JOB TOTAL                                     $27,563
=====

```

```

=====
Estimate:      BLDG 6564          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					300.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		44.70	\$665	\$1,372	\$0	\$0	\$2,037
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					50.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		7.45	\$111	\$229	\$0	\$0	\$340
A09 ELECTRICAL		53	\$776	\$1,601	\$0	\$0	\$2,377

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					275.00 L.F.	
Unit values	0.44	4.17	10.30	0.00	0.00		14.47
Totals	122.10	\$1,147	\$2,833	\$0	\$0		\$3,980
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNCR SZD FOR CVRG 10' OC 1/2" DIAM					330.00 L.F.	
Unit values	0.13	1.64	2.88	0.00	0.00		4.52
Totals	41.91	\$541	\$949	\$0	\$0		\$1,490
1519010320	ALUMINUM REFLECTORS W/HANGERS					38.00 Ea.	
Unit values	0.50	39.79	3.80	0.00	0.00		43.59
Totals	19.00	\$1,512	\$145	\$0	\$0		\$1,657
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.	
Unit values	3.00	738.35	120.15	0.00	0.00		858.50
Totals	3.00	\$738	\$120	\$0	\$0		\$858
1552301020	CRV-100 GAS FIRED BURNER, 100 MBH & COMBUSTION CHAMBER					6.00 Ea.	
Unit values	1.00	860.00	44.06	0.00	0.00		904.06
Totals	6.00	\$5,160	\$264	\$0	\$0		\$5,424
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH					2.00 Ea.	
Unit values	4.00	935.00	81.70	0.00	0.00		1016.70
Totals	8.00	\$1,870	\$163	\$0	\$0		\$2,033
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					2.00 Ea.	
Unit values	1.60	70.00	76.50	0.00	0.00		146.50
Totals	3.20	\$140	\$153	\$0	\$0		\$293
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					3.00 Ea.	
Unit values	1.00	75.00	27.55	0.00	0.00		102.55
Totals	3.00	\$225	\$83	\$0	\$0		\$308
U15 MECHANICAL		207	\$11,333	\$4,710	\$0	\$0	\$16,043

18-Oct-94

## MeansData for Lotus

Page 3

```
=====
Line #      Description
-----
           Manhours  Matl    Labor  Equipment  Sub      Total
=====
1631200100  HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58    0.00      1.00 Ea.    401.34
Totals           2.96    $331      $71      $0        $0        $402

U16 ELECTRICAL      3      $331      $71      $0        $0        $402
```

```
=====
Line #      Description
-----
           Manhours   Matl     Labor   Equipment   Sub     Total
=====
```

ESTIMATE TOTAL	263	\$12,440	\$6,382	\$0	\$0	\$18,822
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$12,440	\$6,382	\$0	\$0	\$18,822
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$18,822

```

=====
Estimate:      BLDG 6564          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
A09 ELECTRICAL      53      $776      $1,601          $0      $0      $2,377
U15 MECHANICAL     207     $11,333      $4,710          $0      $0     $16,043
U16 ELECTRICAL       3       $331        $71           $0      $0       $402

TOTAL              263     $12,440      $6,382          $0      $0     $18,822

SALES TAX          0.00%        $0
MATL MARKUP        0.00%        $0
LABOR MARKUP       0.00%          $0
EQUIPT MARKUP      0.00%          $0
SUB MARKUP         0.00%          $0

TOTAL BEFORE CONTINGENC $12,440      $6,382          $0      $0     $18,822
CONTINGENCY         0.00%          $0
BOND                0.00%          $0
PROFIT              0.00%          $0

JOB TOTAL                                          $18,822

```

```

=====
Estimate:      BLDG 6576           Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    6900.00           City indx: Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					320.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		48.00	\$0	\$1,010	\$411	\$0	\$1,421
0207180380	HVAC DEMO, BOILER GAS/OIL STL >150MBH					0.00 Ea.	
Unit values		12.00	0.00	323.82	0.00	0.00	323.82
Totals		0.00	\$0	\$0	\$0	\$0	\$0
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.75 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		10.91	\$0	\$285	\$0	\$0	\$285
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					170.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		12.07	\$0	\$336	\$40	\$0	\$376
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					50.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		10.00	\$0	\$278	\$34	\$0	\$312
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		88	\$356	\$2,092	\$500	\$0	\$2,948

```

=====
Line #      Description
-----
           Manhours  Matl    Labor  Equipment  Sub    Total
=====
1554510245  HTG INFA-RD UNT GAS ELEC IGN  (See Attached for Breakdown)
                                     1.00 LS
Unit values      8.00    760.00    163.40      0.00  21687.00  22610.40
Totals           8.00      $760      $163        $0   $21,687  $22,610

1562600137  GAS APPLIANCE REGULATORS DOUBLE DIAPHRAGM
           TYPE 1-1/4" PIPE SIZE                                     1.00 Ea.
Unit values      0.53    226.00    12.10      0.00      0.00    238.10
Totals           0.53      $226      $12        $0       $0      $238

U15 MECHANICAL      9      $986      $175        $0   $21,687  $22,848

```

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	97	\$1,342	\$2,267	\$500	\$21,687	\$25,796
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$1,342	\$2,267	\$500	\$21,687	\$25,796
CONTINGENCY	10.00%					\$2,580
BOND	0.00%					\$0
PROFIT	10.00%					\$2,580
JOB TOTAL						\$30,955

```

=====
Estimate:      BLDG 6576           Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    6900.00           City indx: Louisville, KY
=====

```

## SUMMARY

```

=====
              Manhours   Matl      Labor   Equipment   Sub      Total
=====
U02 SITEWORK      88      $356    $2,092     $500        $0      $2,948
U15 MECHANICAL     9      $986     $175        $0      $21,687    $22,848
TOTAL              97     $1,342    $2,267     $500      $21,687    $25,796

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP       0.00%      $0
EQUIPT MARKUP     0.00%      $0
SUB MARKUP         0.00%      $0

TOTAL BEFORE CONTINGENC $1,342    $2,267     $500      $21,687    $25,796
CONTINGENCY        10.00%      $0
BOND               0.00%      $0
PROFIT             10.00%      $0
JOB TOTAL                                $30,955
=====

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```

=====
Estimate:      BLDG 6576      Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					230.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		34.27	\$510	\$1,052	\$0	\$0	\$1,562
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					120.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		17.88	\$266	\$549	\$0	\$0	\$815
A09 ELECTRICAL		53	\$776	\$1,601	\$0	\$0	\$2,377

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					220.00 L.F.	
Unit values	0.44	4.17	10.30	0.00	0.00		14.47
Totals	97.68	\$917	\$2,267	\$0	\$0		\$3,184
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNCR SZD FOR CVRG 10' OC 1/2" DIAM					340.00 L.F.	
Unit values	0.13	1.64	2.88	0.00	0.00		4.52
Totals	43.18	\$558	\$978	\$0	\$0		\$1,536
1519010320	ALUMINUM REFLECTORS W/HANGERS					29.00 Ea.	
Unit values	0.50	39.79	3.80	0.00	0.00		43.59
Totals	14.50	\$1,154	\$110	\$0	\$0		\$1,264
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.	
Unit values	3.00	738.35	120.15	0.00	0.00		858.50
Totals	3.00	\$738	\$120	\$0	\$0		\$858
1552301020	CRV-90 GAS FIRED BURNER, 90 MBH & COMBUSTION CHAMBER					6.00 Ea.	
Unit values	1.00	860.00	44.06	0.00	0.00		904.06
Totals	6.00	\$5,160	\$264	\$0	\$0		\$5,424
1554510160	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 100MBH					1.00 Ea.	
Unit values	6.00	1065.00	163.40	0.00	0.00		1228.40
Totals	6.00	\$1,065	\$163	\$0	\$0		\$1,228
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH					4.00 Ea.	
Unit values	4.00	935.00	81.70	0.00	0.00		1016.70
Totals	16.00	\$3,740	\$327	\$0	\$0		\$4,067
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					5.00 Ea.	
Unit values	1.60	70.00	76.50	0.00	0.00		146.50
Totals	8.00	\$350	\$382	\$0	\$0		\$732
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					6.00 Ea.	
Unit values	1.00	75.00	27.55	0.00	0.00		102.55
Totals	6.00	\$450	\$165	\$0	\$0		\$615

```
=====
Line #      Description
-----
      Manhours   Matl    Labor   Equipment   Sub    Total
=====
U15 MECHANICAL      201    $14,132    $4,776        $0        $0    $18,908
1631200100    HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58    0.00    1.00 Ea.    401.34
Totals            2.96      $331      $71        $0        $0    $402

U16 ELECTRICAL      3      $331      $71        $0        $0    $402
=====
```

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=====
Line #      Description
-----
      Manhours   Matl    Labor   Equipment   Sub    Total
=====
```

ESTIMATE TOTAL	257	\$15,239	\$6,448	\$0	\$0	\$21,687
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$15,239	\$6,448	\$0	\$0	\$21,687
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$21,687

```

=====
Estimate:      BLDG 6576           Date:      14-Oct-94
Description:   INFRARED HEATING SYSTEM COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY       Job #:      94013.02
Sq. footage:   City indx:Louisville, KY
=====

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## SUMMARY

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Manhours  Matl  Labor  Equipment  Sub  Total
=====
A09 ELECTRICAL      53      $776      $1,601          $0      $0      $2,377
U15 MECHANICAL     201     $14,132     $4,776          $0      $0     $18,908
U16 ELECTRICAL       3       $331        $71           $0      $0       $402
TOTAL              257     $15,239     $6,448          $0      $0     $21,687

SALES TAX           0.00%          $0
MATL MARKUP         0.00%          $0
LABOR MARKUP        0.00%          $0
EQUIPT MARKUP       0.00%          $0
SUB MARKUP          0.00%          $0

TOTAL BEFORE CONTINGENC $15,239     $6,448          $0      $0     $21,687
CONTINGENCY          0.00%
BOND                 0.00%
PROFIT               0.00%

JOB TOTAL                                     $21,687

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Estimate:      BLDG 6577          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:   6900.00           City indx:Louisville, KY
=====

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Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					320.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		48.00	\$0	\$1,010	\$411	\$0	\$1,421
0207180380	HVAC DEMO, BOILER GAS/OIL STL >150MBH					1.00 Ea.	
Unit values		12.00	0.00	323.82	0.00	0.00	323.82
Totals		12.00	\$0	\$324	\$0	\$0	\$324
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.75 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		10.91	\$0	\$285	\$0	\$0	\$285
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					170.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		12.07	\$0	\$336	\$40	\$0	\$376
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					50.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		10.00	\$0	\$278	\$34	\$0	\$312
0266907800	CUT IN VALVES, W/DUCK TIP GASKET, 4" DIAMETER					1.00 Ea.	
Unit values		1.56	259.60	35.47	5.91	0.00	300.98
Totals		1.56	\$260	\$35	\$6	\$0	\$301
0268520550	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 1" DIAM					50.00 L.F.	
Unit values		0.11	1.92	2.96	0.17	0.00	5.06
Totals		5.35	\$96	\$148	\$9	\$0	\$253
U02 SITEWORK		100	\$356	\$2,416	\$500	\$0	\$3,272



Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
ESTIMATE TOTAL		109	\$1,342	\$2,591	\$500	\$21,687	\$26,120
SALES TAX	0.00%		\$0				
MATL MARKUP	0.00%		\$0				
LABOR MARKUP	0.00%			\$0			
EQUIPT MARKUP	0.00%				\$0		
SUB MARKUP	0.00%					\$0	
TOTAL BEFORE CONTINGENC			\$1,342	\$2,591	\$500	\$21,687	\$26,120
CONTINGENCY	10.00%						\$2,612
BOND	0.00%						\$0
PROFIT	10.00%						\$2,612
JOB TOTAL							\$31,344

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=====
Estimate:      BLDG 6577          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP (GLASS Bid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   6900.00           City indx: Louisville, KY
=====

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## SUMMARY

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=====
              Manhours   Matl     Labor   Equipment   Sub     Total
=====
U02 SITEWORK      100      $356    $2,416     $500        $0    $3,272
U15 MECHANICAL     9       $986     $175        $0    $21,687    $22,848
TOTAL             109     $1,342    $2,591     $500    $21,687    $26,120

SALES TAX          0.00%        $0
MATL MARKUP        0.00%        $0
LABOR MARKUP       0.00%        $0
EQUIPT MARKUP      0.00%        $0
SUB MARKUP         0.00%        $0

TOTAL BEFORE CONTINGENC $1,342    $2,591     $500    $21,687    $26,120
CONTINGENCY        10.00%          $2,612
BOND               0.00%          $0
PROFIT            10.00%          $2,612
JOB TOTAL                                     $31,344
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=====
Estimate:      BLDG 6577          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
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Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					230.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		34.27	\$510	\$1,052	\$0	\$0	\$1,562
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					120.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		17.88	\$266	\$549	\$0	\$0	\$815
A09 ELECTRICAL		53	\$776	\$1,601	\$0	\$0	\$2,377

=====						
Line #	Description					
	Manhours	Matl	Labor	Equipment	Sub	Total
=====						
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					
					220.00 L.F.	
Unit values	0.44	4.17	10.30	0.00	0.00	14.47
Totals	97.68	\$917	\$2,267	\$0	\$0	\$3,184
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNGR SZD FOR CVRG 10' OC 1/2" DIAM					
					340.00 L.F.	
Unit values	0.13	1.64	2.88	0.00	0.00	4.52
Totals	43.18	\$558	\$978	\$0	\$0	\$1,536
1519010320	ALUMINUM REFLECTORS W/HANGERS					
					29.00 Ea.	
Unit values	0.50	39.79	3.80	0.00	0.00	43.59
Totals	14.50	\$1,154	\$110	\$0	\$0	\$1,264
1524105040	VACUUM PUMP AND VENT PIPING					
					1.00 Ea.	
Unit values	3.00	738.35	120.15	0.00	0.00	858.50
Totals	3.00	\$738	\$120	\$0	\$0	\$858
1552301020	CRV-90 GAS FIRED BURNER, 90 MBH & COMBUSTION CHAMBER					
					6.00 Ea.	
Unit values	1.00	860.00	44.06	0.00	0.00	904.06
Totals	6.00	\$5,160	\$264	\$0	\$0	\$5,424
1554510160	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 100MBH					
					1.00 Ea.	
Unit values	6.00	1065.00	163.40	0.00	0.00	1228.40
Totals	6.00	\$1,065	\$163	\$0	\$0	\$1,228
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH					
					4.00 Ea.	
Unit values	4.00	935.00	81.70	0.00	0.00	1016.70
Totals	16.00	\$3,740	\$327	\$0	\$0	\$4,067
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					
					5.00 Ea.	
Unit values	1.60	70.00	76.50	0.00	0.00	146.50
Totals	8.00	\$350	\$382	\$0	\$0	\$732
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					
					6.00 Ea.	
Unit values	1.00	75.00	27.55	0.00	0.00	102.55
Totals	6.00	\$450	\$165	\$0	\$0	\$615

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=====
Line #      Description
-----
           Manhours  Matl    Labor  Equipment  Sub    Total
=====
U15 MECHANICAL      201    $14,132    $4,776      $0      $0    $18,908
1631200100    HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58      0.00      1.00 Ea.
Totals            2.96      $331      $71        $0      0.00    401.34
                                $0        $0      $0      $0
U16 ELECTRICAL      3      $331      $71        $0      $0    $402
=====
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=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	257	\$15,239	\$6,448	\$0	\$0	\$21,687
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$15,239	\$6,448	\$0	\$0	\$21,687
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$21,687

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Estimate:      BLDG 6577          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY      Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

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## SUMMARY

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=====
Manhours  Matl  Labor  Equipment  Sub  Total
=====
A09 ELECTRICAL      53      $776      $1,601      $0      $0      $2,377
U15 MECHANICAL     201     $14,132     $4,776      $0      $0     $18,908
U16 ELECTRICAL       3      $331       $71        $0      $0      $402
TOTAL              257     $15,239     $6,448      $0      $0     $21,687

SALES TAX           0.00%      $0
MATL MARKUP         0.00%      $0
LABOR MARKUP        0.00%      $0
EQUIPT MARKUP       0.00%      $0
SUB MARKUP          0.00%      $0

TOTAL BEFORE CONTINGENC $15,239     $6,448      $0      $0     $21,687
CONTINGENCY          0.00%
BOND                 0.00%
PROFIT               0.00%

JOB TOTAL                                           $21,687
=====

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# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 6560		BUILDING HEATING TEMPERATURE SETPOINT: 60 F			PAGE 1 OF 3	
		OUTSIDE DESIGN TEMPERATURE			1 F	
		TEMPERATURE DIFFERENCE			59 F	
INFILTRATION LOSSES =	1	AIR CHGS	X	73600	VOL (CU FT)	X 59 F TEMP DIFF X 0.019 = 0.08 MBTU / HR
FLOOR LOSSES =	320	LINEAR FEET OF PERIMETER	X	59	F TEMP DIFF	X 0.81 = 0.02 MBTU / HR
SURFACE HEAT LOSSES						
FLAT BUILT UP ROOF =	4800	AREA (SF)	X	0.105	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.03 MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF)	X	0.176	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
8" CINDER BLOCK WALL =	2440	AREA (SF)	X	0.389	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.06 MBTU / HR
CORR MTL PNL WALL =		AREA (SF)	X	0.17	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
CLR SGL PANE WINDOWS =	1123	AREA (SF)	X	1.235	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.08 MBTU / HR
TINTED DBL PANE WIN'W =		AREA (SF)	X	0.65	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL ROLL UP DOORS =		AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL GLAZED O'HEAD DR =	1372	AREA (SF)	X	0.214	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.02 MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL PERSONNEL DR=		AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
MTL/ GLAZED PERSONNEL=	25	AREA (SF)	X	0.615	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
TOTAL BASELINE HEAT LOSSES					= 0.28 MBTU / HR	
					= 299.19 MJ/HR	

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 6560										BUILDING HEATING TEMPERATURE SETPOINT: 55 F										PAGE 2 OF 3									
										OUTSIDE DESIGN TEMPERATURE 1 F																			
										TEMPERATURE DIFFERENCE 54 F																			
INFILTRATION LOSSES =										1	AIR CHGS	X	73600	VOL (CU FT)	X	54	F TEMP DIFF	X	0.019	=	0.08	MBTU / HR							
FLOOR LOSSES =										320	LINEAR FEET OF PERIMETER				X	54	F TEMP DIFF	X	0.81	=	0.01	MBTU / HR							
SURFACE HEAT LOSSES																													
FLAT BUILT UP ROOF =										4800	AREA (SF)	X	0.105	U VALUE (BTU/HR - SF - F)	X	54	F TEMPERATURE DIFFERENCE	=	0.03	MBTU / HR									
FACE BRICK/BLK WALL =										0	AREA (SF)	X	0.176	U VALUE (BTU/HR - SF - F)	X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR									
8" CINDER BLOCK WALL =										2440	AREA (SF)	X	0.389	U VALUE (BTU/HR - SF - F)	X	54	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR									
CORR MTL PNL WALL =										0	AREA (SF)	X	0.17	U VALUE (BTU/HR - SF - F)	X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR									
CLR SGL PANE WINDOWS =										1123	AREA (SF)	X	1.235	U VALUE (BTU/HR - SF - F)	X	54	F TEMPERATURE DIFFERENCE	=	0.07	MBTU / HR									
TINTED DBL.PANE WIN'W =										0	AREA (SF)	X	0.65	U VALUE (BTU/HR - SF - F)	X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR									
METAL ROLL UP DOORS =										0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR									
WOOD GLAZED O'HEAD DR =										1372	AREA (SF)	X	0.214	U VALUE (BTU/HR - SF - F)	X	54	F TEMPERATURE DIFFERENCE	=	0.02	MBTU / HR									
LG MTL SLIDING DOOR =										0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR									
METAL PERSONNEL DR=										0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR									
MTL/ GLAZED PERSONNEL=										25	AREA (SF)	X	0.615	U VALUE (BTU/HR - SF - F)	X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR									
TOTAL ECO HEAT LOSSES										=	0.26										MBTU / HR								
										=	273.83										MJ/HR								

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	BUILDING NUMBER	6560	GLOSSARY OF TERMS
SYSTEM EFFICIENCY	60%	ECO - 1	1 MBTU = 1055 MJ
OUTSIDE DESIGN TEMP (F)	1	90%	0.019=CONSTANT
HTG TEMP SETPOINT (F)	60	55	.81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE
HEATING DEGREE DAYS	4616	3396	CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS
TOTAL HEAT LOSSES	0.28	0.26	65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2
(MBTU / HR)			
\$ /MBTU -FUEL OIL	\$6.60	\$6.60	
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62	
\$ /MBTU -PPG	\$10.84	\$10.84	

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.28	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	887.50	MBTU/YR
	0.6	SYS EFF	X	59	TEMP DIFFERENCE						
ECO - 1 =	0.26	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	435.29	MBTU/YR
	0.9	SYS EFF	X	54	TEMP DIFFERENCE						
	435.29	MBTU/YR	X		CORR FACTOR	1			=	435.29	MBTU/YR
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS	=								=	452.21	MBTU/YR
										477,080.96	MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	887.50	MBTU / YR	X	6.6	\$ /MBTU	=	5,857.50	\$ /YR
ECO - 1 =	435.29	MBTU / YR	X	4.62	\$ /MBTU	=	2,011.04	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS	=					=	3,846.46	\$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 6561		BUILDING HEATING TEMPERATURE SETPOINT: 60 F		PAGE 1 OF 3	
		OUTSIDE DESIGN TEMPERATURE		1 F	
		TEMPERATURE DIFFERENCE		59 F	
INFILTRATION LOSSES =	1	AIR CHGS X	73600	VOL (CU FT) X	59 F TEMP DIFF X 0.019 = 0.08 MBTU / HR
FLOOR LOSSES =	320	LINEAR FEET OF PERIMETER X		59 F TEMP DIFF X 0.81 = 0.02 MBTU / HR	
<b>SURFACE HEAT LOSSES</b>					
FLAT BUILT UP ROOF =	4800	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.03 MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
8" CINDER BLOCK WALL =	2440	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.06 MBTU / HR
CORR MTL PNL WALL =		AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
CLR SGL PANE WINDOWS =	1123	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.08 MBTU / HR
TINTED DBL PANE WIN'W =		AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL ROLL UP DOORS =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL GLAZED O'HEAD DR =	1372	AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.02 MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL PERSONNEL DR=		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
MTL/ GLAZED PERSONNEL=	25	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
<b>TOTAL BASELINE HEAT LOSSES</b>				=	<b>0.28 MBTU / HR</b>
				=	<b>299.19 MJ/HR</b>

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 6561

BUILDING HEATING TEMPERATURE SETPOINT: 55 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 54 F

INFILTRATION LOSSES = 1 AIR CHGS X 73600 VOL (CU FT) X 54 F TEMP DIFF X 0.019 = 0.08 MBTU / HR

FLOOR LOSSES = 320 LINEAR FEET OF PERIMETER X 54 F TEMP DIFF X 0.81 = 0.01 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF = 4800 AREA (SF) X 0.105 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.03 MBTU / HR

FACE BRICK/BLK WALL = 0 AREA (SF) X 0.176 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

8" CINDER BLOCK WALL = 2440 AREA (SF) X 0.389 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR

CORR MTL PNL WALL = 0 AREA (SF) X 0.17 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

CLR SGL PANE WINDOWS = 1123 AREA (SF) X 1.235 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.07 MBTU / HR

TINTED DBL PANE WIN'W = 0 AREA (SF) X 0.65 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

METAL ROLL UP DOORS = 0 AREA (SF) X 0.56 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

WOOD GLAZED O'HEAD DR = 1372 AREA (SF) X 0.214 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.02 MBTU / HR

LG MTL SLIDING DOOR = 0 AREA (SF) X 0.56 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

METAL PERSONNEL DR = 0 AREA (SF) X 0.56 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

MTL/ GLAZED PERSONNEL = 25 AREA (SF) X 0.615 U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

### TOTAL ECO HEAT LOSSES

= 0.26 MBTU / HR  
= 273.83 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	BASELINE	ECO - 1
SYSTEM EFFICIENCY	60%	90%
OUTSIDE DESIGN TEMP (F)	1	1
HTG TEMP SETPOINT (F)	60	55
HEATING DEGREE DAYS	4616	3396
TOTAL HEAT LOSSES (MBTU / HR)	0.28	0.26
\$ /MBTU -FUEL OIL	\$6.60	\$6.60
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62
\$ /MBTU -PPG	\$10.84	\$10.84

BUILDING NUMBER 6561

### GLOSSARY OF TERMS

1 MBTU = 1055 MJ  
 0.019=CONSTANT  
 .81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE  
 CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS  
 65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.28	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	887.50	MBTU/YR
	0.6	SYSEFF	X	59	TEMP DIFFERENCE						
ECO - 1 =	887.50	MBTU/YR		X	CORR FACTOR		1		=	887.50	MBTU/YR
	0.26	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY			
	0.9	SYSEFF	X	54	TEMP DIFFERENCE						
	435.29	MBTU/YR		X	CORR FACTOR		1				
										435.29	MBTU/YR
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS											
										452.21	MBTU/YR
										477,080.96	MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	887.50	MBTU / YR	X	6.6	\$ /MBTU	=	5,857.50	\$ /YR
ECO - 1 =	435.29	MBTU / YR	X	4.62	\$ /MBTU	=	2,011.04	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS =								3,846.46 \$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 6562		BUILDING HEATING TEMPERATURE SETPOINT: 60 F		PAGE 1 OF 3				
		OUTSIDE DESIGN TEMPERATURE		1 F				
		TEMPERATURE DIFFERENCE		59 F				
INFILTRATION LOSSES =	1	AIR CHGS X	73600	VOL (CU FT) X	59 F TEMP DIFF X 0.019 =	0.08	MBTU / HR	
FLOOR LOSSES =	320	LINEAR FEET OF PERIMETER X		59 F TEMP DIFF X 0.81 =	0.02	MBTU / HR		
<b>SURFACE HEAT LOSSES</b>								
FLAT BUILT UP ROOF =	4800	AREA (SF) X	0.105	U VALUE (BTU/HR-SF-F) X	59 F TEMPERATURE DIFFERENCE	=	0.03	MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR-SF-F) X	59 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2440	AREA (SF) X	0.389	U VALUE (BTU/HR-SF-F) X	59 F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
CORR MTL PNL WALL =		AREA (SF) X	0.17	U VALUE (BTU/HR-SF-F) X	59 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
CLR SGL PANE WINDOWS =	1123	AREA (SF) X	1.235	U VALUE (BTU/HR-SF-F) X	59 F TEMPERATURE DIFFERENCE	=	0.08	MBTU / HR
TINTED DBL PANE WIN"W =		AREA (SF) X	0.65	U VALUE (BTU/HR-SF-F) X	59 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =		AREA (SF) X	0.56	U VALUE (BTU/HR-SF-F) X	59 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL GLAZED O'HEAD DR =	1372	AREA (SF) X	0.214	U VALUE (BTU/HR-SF-F) X	59 F TEMPERATURE DIFFERENCE	=	0.02	MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR-SF-F) X	59 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=		AREA (SF) X	0.56	U VALUE (BTU/HR-SF-F) X	59 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL=	25	AREA (SF) X	0.615	U VALUE (BTU/HR-SF-F) X	59 F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
<b>TOTAL BASELINE HEAT LOSSES</b>						=	0.28	MBTU / HR
						=	299.19	MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 6562		BUILDING HEATING TEMPERATURE SETPOINT: 55 F				PAGE 2 OF 3	
		OUTSIDE DESIGN TEMPERATURE					
		TEMPERATURE DIFFERENCE					
		1 F					
		54 F					
INFILTRATION LOSSES =	1	AIR CHGS	X	73600	VOL (CU FT)	X	54 F TEMP DIFF X 0.019 = 0.08 MBTU / HR
FLOOR LOSSES =	320	LINEAR FEET OF PERIMETER	X	54 F TEMP DIFF	X	0.81	= 0.01 MBTU / HR
SURFACE HEAT LOSSES							
FLAT BUILT UP ROOF =	4800	AREA (SF)	X	0.105	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.03 MBTU / HR
FACE BRICK/BLK WALL =	0	AREA (SF)	X	0.176	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
8" CINDER BLOCK WALL =	2440	AREA (SF)	X	0.389	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR
CORR MTL PNL WALL =	0	AREA (SF)	X	0.17	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
CLR SGL PANE WINDOWS =	1123	AREA (SF)	X	1.235	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.07 MBTU / HR
TINTED DBL PANE WIN'W =	0	AREA (SF)	X	0.65	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL ROLL UP DOORS =	0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
WOOD GLAZED O'HEAD DR =	1372	AREA (SF)	X	0.214	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.02 MBTU / HR
LG MTL SLIDING DOOR =	0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
METAL PERSONNEL DR=	0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
MTL/ GLAZED PERSONNEL=	25	AREA (SF)	X	0.615	U VALUE (BTU/HR - SF - F)	X	54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR
TOTAL ECO HEAT LOSSES						=	0.26 MBTU / HR
						=	273.83 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	BUILDING NUMBER	6562	GLOSSARY OF TERMS
SYSTEM EFFICIENCY	60%	90%	1 MBTU = 1055 MJ
OUTSIDE DESIGN TEMP (F)	1	1	0.019=CONSTANT
HTG TEMP SETPOINT (F)	60	55	.81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE
HEATING DEGREE DAYS	4616	3396	CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS
TOTAL HEAT LOSSES	0.28	0.26	65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2
(MBTU / HR)			
\$ /MBTU -FUEL OIL	\$6.60	\$6.60	
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62	
\$ /MBTU -PPG	\$10.84	\$10.84	

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.28	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	887.50	MBTU/YR
	0.6	SYSEFF	X	59	TEMP DIFFERENCE						
	887.50	MBTU/YR	X		CORR FACTOR	1			=	887.50	MBTU/YR
ECO - 1 =	0.26	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	435.29	MBTU/YR
	0.9	SYSEFF	X	54	TEMP DIFFERENCE						
	435.29	MBTU/YR	X		CORR FACTOR	1			=	435.29	MBTU/YR
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS	=								=	452.21	MBTU/YR
										477,080.96	MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	887.50	MBTU / YR	X	6.6	\$ /MBTU	=	5,857.50	\$ /YR
ECO - 1 =	435.29	MBTU / YR	X	4.62	\$ /MBTU	=	2,011.04	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS	=					=	3,846.46	\$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 1 OF 3

BUILDING NUMBER: 6563 BUILDING HEATING TEMPERATURE SETPOINT: 60 F  
 OUTSIDE DESIGN TEMPERATURE 1 F  
 TEMPERATURE DIFFERENCE 59 F

INFILTRATION LOSSES = 1 AIR CHGS X 73600 VOL (CU FT) X 59 F TEMP DIFF X 0.019 = 0.08 MBTU / HR  
 FLOOR LOSSES = 320 LINEAR FEET OF PERIMETER X 59 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	4800	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.03	MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2440	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
CORR MTL PNL WALL =		AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
CLR SGL PANE WINDOWS =	1123	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.08	MBTU / HR
TINTED DBL PANE WIN"W =		AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL GLAZED O'HEAD DR =	1372	AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.02	MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/GLAZED PERSONNEL=	25	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

TOTAL BASELINE HEAT LOSSES  
 = 0.28 MBTU / HR  
 = 299.19 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 6563

BUILDING HEATING TEMPERATURE SETPOINT: 55 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 54 F

INFILTRATION LOSSES = 1 AIR CHGS X 73600 VOL (CU FT) X 54 F TEMP DIFF X 0.019 = 0.08 MBTU / HR

FLOOR LOSSES = 320 LINEAR FEET OF PERIMETER X 54 F TEMP DIFF X 0.81 = 0.01 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF = 4800 AREA (SF) X 0.105 U VALUE (BTU/HR-SF-F) X 54 F TEMPERATURE DIFFERENCE = 0.03 MBTU / HR

FACE BRICK/BLK WALL = 0 AREA (SF) X 0.176 U VALUE (BTU/HR-SF-F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

8" CINDER BLOCK WALL = 2440 AREA (SF) X 0.389 U VALUE (BTU/HR-SF-F) X 54 F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR

CORR MTL PNL WALL = 0 AREA (SF) X 0.17 U VALUE (BTU/HR-SF-F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

CLR SGL PANE WINDOWS = 1123 AREA (SF) X 1.235 U VALUE (BTU/HR-SF-F) X 54 F TEMPERATURE DIFFERENCE = 0.07 MBTU / HR

TINTED DBL PANE WIN'W = 0 AREA (SF) X 0.65 U VALUE (BTU/HR-SF-F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

METAL ROLL UP DOORS = 0 AREA (SF) X 0.56 U VALUE (BTU/HR-SF-F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

WOOD GLAZED O'HEAD DR = 1372 AREA (SF) X 0.214 U VALUE (BTU/HR-SF-F) X 54 F TEMPERATURE DIFFERENCE = 0.02 MBTU / HR

LG MTL SLIDING DOOR = 0 AREA (SF) X 0.56 U VALUE (BTU/HR-SF-F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

METAL PERSONNEL DR = 0 AREA (SF) X 0.56 U VALUE (BTU/HR-SF-F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

MTL/ GLAZED PERSONNEL = 25 AREA (SF) X 0.615 U VALUE (BTU/HR-SF-F) X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR

### TOTAL ECO HEAT LOSSES

= 0.26 MBTU / HR  
= 273.83 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	BASELINE	ECO - 1
SYSTEM EFFICIENCY	60%	90%
OUTSIDE DESIGN TEMP (F)	1	1
HTG TEMP SETPOINT (F)	60	55
HEATING DEGREE DAYS	4616	3396
TOTAL HEAT LOSSES (MBTU / HR)	0.28	0.26
\$ /MBTU -FUEL OIL	\$6.60	\$6.60
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62
\$ /MBTU -PPG	\$10.84	\$10.84

BUILDING NUMBER 6563

### GLOSSARY OF TERMS

1 MBTU = 1055 MJ  
 0.019=CONSTANT  
 .81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE  
 CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS  
 65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.28	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	887.50	MBTU/YR
	0.6	SYS EFF	X	59	TEMP DIFFERENCE						
ECO - 1 =	0.26	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	435.29	MBTU/YR
	0.9	SYS EFF	X	54	TEMP DIFFERENCE						
	435.29	MBTU/YR	X		CORR FACTOR		1		=	435.29	MBTU/YR
ECO -1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS									=	452.21	MBTU/YR
										477,080.96	MJ/YR

## ANNUAL HEATING ENERGY COST

BASELINE =	887.50	MBTU / YR	X	6.6	\$ /MBTU	=	5,857.50	\$ /YR
ECO - 1 =	435.29	MBTU / YR	X	4.62	\$ /MBTU	=	2,011.04	\$ /YR
ECO -1 ANNUAL HEATING ENERGY COST SAVINGS						=	3,846.46	\$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 6564		BUILDING HEATING TEMPERATURE SETPOINT: 60 F					PAGE 1 OF 3			
		OUTSIDE DESIGN TEMPERATURE 1 F								
		TEMPERATURE DIFFERENCE 59 F								
INFILTRATION LOSSES =		1	AIR CHGS X	73600	VOL (CU FT) X	59	F TEMP DIFF X 0.019 =	0.08	MBTU / HR	
FLOOR LOSSES =		320	LINEAR FEET OF PERIMETER X		59	F TEMP DIFF X 0.81 =	0.02	0.02	MBTU / HR	
SURFACE HEAT LOSSES										
FLAT BUILT UP ROOF =		4800	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.03	MBTU / HR
FACE BRICK/BLK WALL =			AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =		2440	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
CORR MTL PNL WALL =			AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
CLR SGL PANE WINDOWS =		1123	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.08	MBTU / HR
TINTED DBL PANE WIN'W =			AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =			AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL GLAZED O'HEAD DR =		1372	AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.02	MBTU / HR
LG MTL SLIDING DOOR =			AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=			AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/GLAZED PERSONNEL=		25	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
TOTAL BASELINE HEAT LOSSES										
								=	0.28	MBTU / HR
								=	299.19	MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3									
BUILDING NUMBER: 6564		BUILDING HEATING TEMPERATURE SETPOINT: 55 F					55 F		
		OUTSIDE DESIGN TEMPERATURE					1 F		
		TEMPERATURE DIFFERENCE					54 F		
INFILTRATION LOSSES =		1	AIR CHGS	X	73600	VOL (CU FT)	X	54 F TEMP DIFF	X 0.019 = 0.08 MBTU / HR
FLOOR LOSSES =		320	LINEAR FEET OF PERIMETER		X	54 F TEMP DIFF	X 0.81 = 0.01 MBTU / HR		
SURFACE HEAT LOSSES									
FLAT BUILT UP ROOF =		4800	AREA (SF)	X	0.105	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE = 0.03 MBTU / HR		
FACE BRICK/BLK WALL =		0	AREA (SF)	X	0.176	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR		
8" CINDER BLOCK WALL =		2440	AREA (SF)	X	0.389	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE = 0.05 MBTU / HR		
CORR MTL PNL WALL =		0	AREA (SF)	X	0.17	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR		
CLR SGL PANE WINDOWS =		1123	AREA (SF)	X	1.235	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE = 0.07 MBTU / HR		
TINTED DBL PANE WIN"W =		0	AREA (SF)	X	0.65	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR		
METAL ROLL UP DOORS =		0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR		
WOOD GLAZED O'HEAD DR =		1372	AREA (SF)	X	0.214	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE = 0.02 MBTU / HR		
LG MTL SLIDING DOOR =		0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR		
METAL PERSONNEL DR=		0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR		
MTL/ GLAZED PERSONNEL=		25	AREA (SF)	X	0.615	U VALUE (BTU/HR - SF - F)	X 54 F TEMPERATURE DIFFERENCE = 0.00 MBTU / HR		
TOTAL ECO HEAT LOSSES									= 0.26 MBTU / HR
									= 273.83 MJ/HR



# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 1 OF 3

BUILDING NUMBER: 6576 BUILDING HEATING TEMPERATURE SETPOINT: 60 F  
 OUTSIDE DESIGN TEMPERATURE 1 F  
 TEMPERATURE DIFFERENCE 59 F

INFILTRATION LOSSES = 1 AIR CHGS X 114900 VOL (CU FT) X 59 F TEMP DIFF X 0.019 = 0.13 MBTU / HR  
 FLOOR LOSSES = 350 LINEAR FEET OF PERIMETER X 59 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	6900	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2936	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.07	MBTU / HR
CORR MTL PNL WALL =	1165	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
TINTED DBL PANE WIN'W =		AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL GLAZED O'HEAD DR =	1344	AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.02	MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/GLAZED PERSONNEL=	25	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL BASELINE HEAT LOSSES

= 0.34 MBTU / HR  
 = 359.33 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 6576 BUILDING HEATING TEMPERATURE SETPOINT: 55 F  
 OUTSIDE DESIGN TEMPERATURE 1 F  
 TEMPERATURE DIFFERENCE 54 F

INFILTRATION LOSSES = 1 AIR CHGS X 114900 VOL (CU FT) X 54 F TEMP DIFF X 0.019 = 0.12 MBTU / HR  
 FLOOR LOSSES = 350 LINEAR FEET OF PERIMETER X 54 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	6900	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
FACE BRICK/BLK WALL =	0	AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2936	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
CORR MTL PNL WALL =	1165	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.05	MBTU / HR
TINTED DBL PANE WIN"W =	0	AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
WOOD GLAZED O'HEAD DR =	1344	AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.02	MBTU / HR
LG MTL SLIDING DOOR =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/ GLAZED PERSONNEL=	25	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	54	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

### TOTAL ECO HEAT LOSSES

= 0.31 MBTU / HR  
 = 328.88 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

	BASLINE	ECO - 1	BUILDING NUMBER	6576	GLOSSARY OF TERMS
SYSTEM EFFICIENCY	60%	90%			1 MBTU = 1055 MJ
OUTSIDE DESIGN TEMP (F)	1	1			0.019=CONSTANT
HTG TEMP SETPOINT (F)	60	55			.81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE
HEATING DEGREE DAYS	4616	3396			CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS
TOTAL HEAT LOSSES	0.34	0.31			65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2
(MBTU / HR)					
\$ /MBTU -FUEL OIL	\$6.60	\$6.60			
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62			
\$ /MBTU -PPG	\$10.84	\$10.84			

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.34	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	1,065.90	MBTU/YR
	0.6	SYS EFF	X	59	TEMP DIFFERENCE						
	1,065.90	MBTU/YR		X	CORR FACTOR		1		=		1,065.90
ECO - 1 =	0.31	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	522.79	MBTU/YR
	0.9	SYS EFF	X	54	TEMP DIFFERENCE						
	522.79	MBTU/YR		X	CORR FACTOR		1		=		522.79
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS											
									=	543.11	MBTU/YR
									=	572,980.27	MJ/YR

## ANNUAL HEATING ENERGY COST

BASLINE =	1,065.90	MBTU / YR	X	6.6	\$ /MBTU	=	7,034.93	\$ /YR
ECO - 1 =	522.79	MBTU / YR	X	4.62	\$ /MBTU	=	2,415.28	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS =								4,619.64 \$ /YR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 1 OF 3

BUILDING NUMBER: 6577 BUILDING HEATING TEMPERATURE SETPOINT: 60 F  
OUTSIDE DESIGN TEMPERATURE 1 F  
TEMPERATURE DIFFERENCE 59 F

INFILTRATION LOSSES = 1 AIR CHGS X 114900 VOL (CU FT) X 59 F TEMP DIFF X 0.019 = 0.13 MBTU / HR  
FLOOR LOSSES = 350 LINEAR FEET OF PERIMETER X 59 F TEMP DIFF X 0.81 = 0.02 MBTU / HR

### SURFACE HEAT LOSSES

FLAT BUILT UP ROOF =	6900	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.04	MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
8" CINDER BLOCK WALL =	2936	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.07	MBTU / HR
CORR MTL PNL WALL =	1165	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.01	MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.06	MBTU / HR
TINTED DBL PANE WIN"W =		AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL ROLL UP DOORS =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL GLAZED O'HEAD DR =	1344	AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.02	MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
METAL PERSONNEL DR=		AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR
MTL/GLAZED PERSONNEL=	25	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X	59	F TEMPERATURE DIFFERENCE	=	0.00	MBTU / HR

TOTAL BASELINE HEAT LOSSES  
= 0.34 MBTU / HR  
= 359.33 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 2 OF 3

BUILDING NUMBER: 6577		BUILDING HEATING TEMPERATURE SETPOINT: 55 F			
		OUTSIDE DESIGN TEMPERATURE 1 F			
		TEMPERATURE DIFFERENCE 54 F			
INFILTRATION LOSSES =	1	AIR CHGS X	114900	VOL (CU FT) X 54 F TEMP DIFF X 0.019	= 0.12 MBTU / HR
FLOOR LOSSES =	350	LINEAR FEET OF PERIMETER X	54 F TEMP DIFF X 0.81	=	0.02 MBTU / HR
SURFACE HEAT LOSSES					
FLAT BUILT UP ROOF =	6900	AREA (SF) X	0.105	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE	= 0.04 MBTU / HR
FACE BRICK/BLK WALL =	0	AREA (SF) X	0.176	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE	= 0.00 MBTU / HR
8" CINDER BLOCK WALL =	2936	AREA (SF) X	0.389	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE	= 0.06 MBTU / HR
CORR MTL PNL WALL =	1165	AREA (SF) X	0.17	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE	= 0.01 MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF) X	1.235	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE	= 0.05 MBTU / HR
TINTED DBL PANE WIN"W =	0	AREA (SF) X	0.65	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE	= 0.00 MBTU / HR
METAL ROLL UP DOORS =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE	= 0.00 MBTU / HR
WOOD GLAZED O'HEAD DR =	1344	AREA (SF) X	0.214	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE	= 0.02 MBTU / HR
LG MTL SLIDING DOOR =	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE	= 0.00 MBTU / HR
METAL PERSONNEL DR=	0	AREA (SF) X	0.56	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE	= 0.00 MBTU / HR
MTL/GLAZED PERSONNEL=	25	AREA (SF) X	0.615	U VALUE (BTU/HR - SF - F) X 54 F TEMPERATURE DIFFERENCE	= 0.00 MBTU / HR
TOTAL ECO HEAT LOSSES					= 0.31 MBTU / HR
					= 328.88 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 3 OF 3

SYSTEM EFFICIENCY	BASELINE	ECO - 1	BUILDING NUMBER	6577	GLOSSARY OF TERMS
OUTSIDE DESIGN TEMP (F)	60%	90%			1 MBTU = 1055 MJ
HTG TEMP SETPOINT (F)	1	1			0.019=CONSTANT
HEATING DEGREE DAYS	60	55			.81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE
TOTAL HEAT LOSSES (MBTU / HR)	4616	3396			CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS
\$ /MBTU -FUEL OIL	0.34	0.31			65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2
\$ /MBTU -NATURAL GAS	\$6.60	\$6.60			
\$ /MBTU -PPG	\$4.62	\$4.62			
	\$10.84	\$10.84			

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

BASELINE =	0.34	MBTU / HR	X	4616	DEGREE DAYS	X	24	HRS/DAY	=	1,065.90	MBTU/YR
	0.6	SYSEFF	X	59	TEMP DIFFERENCE						
	1,065.90	MBTU/YR	X		CORR FACTOR		1		=		1,065.90
ECO - 1 =	0.31	MBTU / HR	X	3396	DEGREE DAYS	X	24	HRS/DAY	=	522.79	MBTU/YR
	0.9	SYSEFF	X	54	TEMP DIFFERENCE						
	522.79	MBTU/YR	X		CORR FACTOR		1		=		522.79
ECO - 1 ANNUAL HEATING ENERGY CONSUMPTION SAVINGS											
									=	543.11	MBTU/YR
									=	572,980.27	MJ/YR

## ANNUAL HEATING ENERGY COST

<b>BASELINE =</b>	1,065.90	MBTU / YR	X	6.6	\$ /MBTU	=	7,034.93	\$ /YR
<b>ECO - 1 =</b>	522.79	MBTU / YR	X	4.62	\$ /MBTU	=	2,415.28	\$ /YR
<b>ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS =</b>								<b>4,619.64 \$ /YR</b>

LIFE CYCLE COST ANALYSIS SUMMARY

STUDY: 6592ECO1  
LCCID 1.080

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

INSTALLATION & LOCATION: FORT KNOX      REGION NOS. 4      CENSUS: 3

PROJECT NO. & TITLE: 6592ECO1      ECO-1 INFRARED HEAT

FISCAL YEAR 95      DISCRETE PORTION NAME: INFRARED

ANALYSIS DATE: 10-18-94      ECONOMIC LIFE 20 YEARS      PREPARED BY: JAH

1. INVESTMENT

A. CONSTRUCTION COST	\$	34056.		
B. SIOH	\$	1703.		
C. DESIGN COST	\$	1703.		
D. TOTAL COST (1A+1B+1C)	\$	37462.		
E. SALVAGE VALUE OF EXISTING EQUIPMENT	\$	0.		
F. PUBLIC UTILITY COMPANY REBATE	\$	0.		
G. TOTAL INVESTMENT (1D - 1E - 1F)	\$			37462.

2. ENERGY SAVINGS (+) / COST (-)

DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTORS OCT 1993

FUEL	UNIT COST \$/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL \$ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	\$ .00	0.	\$ 0.	15.61	\$ 0.
B. DIST	\$ 6.60	0.	\$ 0.	17.56	\$ 0.
C. RESID	\$ .00	0.	\$ 0.	19.97	\$ 0.
D. NAT G	\$ 4.62	671.	\$ 3100.	20.96	\$ 64973.
E. COAL	\$ .00	0.	\$ 0.	17.58	\$ 0.
F. LPG	\$ .00	0.	\$ 0.	16.12	\$ 0.
M. DEMAND SAVINGS			\$ 0.	14.74	\$ 0.
N. TOTAL		671.	\$ 3100.		\$ 64973.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)

(1) DISCOUNT FACTOR (TABLE A)	14.74	\$ 990.
(2) DISCOUNTED SAVING/COST (3A X 3A1)		\$ 14593.

B. NON RECURRING SAVINGS(+) / COSTS(-)

ITEM	SAVINGS(+) COST(-) (1)	YR OC (2)	DISCNT FACTR (3)	DISCOUNTED SAVINGS(+)/ COST(-) (4)
1. REPAIR	\$ 3992.	5	.86	3433.
2. REPAIR2	\$ 3992.	15	.63	2515.
3. REPAIR3	\$ 3211.	7	.81	2601.
4. REPAIR4	\$ 3211.	14	.65	2087.

d. TOTAL      \$ 14407.      10637.

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-) (3A2+3Bd4) \$ 25229.

4. FIRST YEAR DOLLAR SAVINGS  $2N3+3A+(3Bd1/(YRS \text{ ECONOMIC LIFE}))$  \$ 4810.

5. SIMPLE PAYBACK PERIOD (1G/4) 7.79 YEARS

6. TOTAL NET DISCOUNTED SAVINGS (2N5+3C) \$ 90202.

7. SAVINGS TO INVESTMENT RATIO (SIR) = (6 / 1G) = 2.41  
(IF < 1 PROJECT DOES NOT QUALIFY)

8. ADJUSTED INTERNAL RATE OF RETURN (AIRR): 7.73 %

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=====
Estimate:      BLDG 6592          Date:      14-Oct-94
Description:    COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    8100.00          City indx:Louisville, KY
=====

```

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0205543200	SITE REMOVAL, STEEL PIPE, WELDED CONNECTION, 4" DIAMETER					300.00 L.F.	
Unit values		0.15	0.00	3.16	1.29	0.00	4.44
Totals		45.00	\$0	\$947	\$386	\$0	\$1,333
0207180380	HVAC DEMO, BOILER GAS/OIL STL >150MBH					1.00 Ea.	
Unit values		12.00	0.00	323.82	0.00	0.00	323.82
Totals		12.00	\$0	\$324	\$0	\$0	\$324
0207183600	HVAC DEMO, MECH EQPT HEAVY ITEM					0.50 Ton	
Unit values		14.55	0.00	380.36	0.00	0.00	380.36
Totals		7.27	\$0	\$190	\$0	\$0	\$190
0208400600	REMOVE PIPE INSULATION UP TO 4" DIAMETER PIPE					300.00 L.F.	
Unit values		0.07	0.00	1.97	0.24	0.00	2.21
Totals		21.30	\$0	\$592	\$71	\$0	\$663
0208401000	REMOVE INSULATION FROM PIPE FITTING, UP TO 4" DIAMETER PIPE					60.00 Ea.	
Unit values		0.20	0.00	5.55	0.68	0.00	6.23
Totals		12.00	\$0	\$333	\$41	\$0	\$374
0268520600	GAS SERVICE&DISTRIB PIPING, SCH40 STEEL PLAIN END, TAR COAT&WRAP 2" DIAM					50.00 L.F.	
Unit values		0.11	2.19	3.18	0.19	0.00	5.55
Totals		5.70	\$109	\$159	\$9	\$0	\$277
U02 SITEWORK		104	\$109	\$2,545	\$507	\$0	\$3,161



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=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	104	\$109	\$2,545	\$507	\$25,219	\$28,380
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$109	\$2,545	\$507	\$25,219	\$28,380
CONTINGENCY	10.00%					\$2,838
BOND	0.00%					\$0
PROFIT	10.00%					\$2,838
JOB TOTAL						\$34,056

```

=====
Estimate:      BLDG 6592          Date:      14-Oct-94
Description:   COST ESTIMATE
Project:       LIMITED EEAP (GLASS Bid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   8100.00           City indx: Louisville, KY
=====

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## SUMMARY

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=====
              Manhours   Matl     Labor   Equipment   Sub       Total
=====
U02 SITEWORK      104      $109    $2,545    $507        $0      $3,161
U15 MECHANICAL      0        $0      $0        $0      $25,219  $25,219
TOTAL              104      $109    $2,545    $507      $25,219  $28,380

SALES TAX          0.00%      $0
MATL MARKUP        0.00%      $0
LABOR MARKUP        0.00%      $0
EQUIPT MARKUP      0.00%      $0
SUB MARKUP          0.00%      $0

TOTAL BEFORE CONTINGENC  $109    $2,545    $507    $25,219  $28,380
CONTINGENCY          10.00%      $2,838
BOND                  0.00%      $0
PROFIT               10.00%      $2,838
JOB TOTAL                                $34,056
=====

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=====
Estimate:      BLDG 6592          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:        LIMITED EEAP(GLASSBid Date:
Location:       FORT KNOX, KY     Job #:      94013.02
Sq. footage:    City indx:Louisville, KY
=====

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Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
0913100200	115V, 20 AMP POWER WIRING INCL CONDUIT, WIRE, AND RECEPTACLES					340.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		50.66	\$753	\$1,555	\$0	\$0	\$2,308
0913100200	CO-RAY-VAC VANTAGE 2 POWER FEEDER INSTALLATION, INCL CONDUIT, WIRE, AND RECEPTACLES					120.00 L.F.	
Unit values		0.15	2.22	4.57	0.00	0.00	6.79
Totals		17.88	\$266	\$549	\$0	\$0	\$815
A09 ELECTRICAL		69	\$1,019	\$2,104	\$0	\$0	\$3,123

Line #	Description	Manhours	Matl	Labor	Equipment	Sub	Total
1517010650	BLACK STEEL RADIANT PIPE, SCHEDULE 40, THREADED, 4" DIAM W/CPLGS					330.00 L.F.	
Unit values		0.44	4.17	10.30	0.00	0.00	14.47
Totals		146.52	\$1,376	\$3,400	\$0	\$0	\$4,776
1517011310	GAS SERVICE PIPE STEEL GALV SCH 40 THRD W/CPLG & HNCR SZD FOR CVRG 10' OC 1/2" DIAM					450.00 L.F.	
Unit values		0.13	1.64	2.88	0.00	0.00	4.52
Totals		57.15	\$738	\$1,294	\$0	\$0	\$2,032
1519010320	ALUMINUM REFLECTORS W/HANGERS					45.00 Ea.	
Unit values		0.50	39.79	3.80	0.00	0.00	43.59
Totals		22.50	\$1,791	\$171	\$0	\$0	\$1,962
1524105040	VACUUM PUMP AND VENT PIPING					1.00 Ea.	
Unit values		3.00	738.35	120.15	0.00	0.00	858.50
Totals		3.00	\$738	\$120	\$0	\$0	\$858
1552301020	CRV-100 GAS FIRED BURNER, 100 MBH & COMBUSTION CHAMBER					6.00 Ea.	
Unit values		1.00	860.00	44.06	0.00	0.00	904.06
Totals		6.00	\$5,160	\$264	\$0	\$0	\$5,424
1554510160	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNT, GAS 100MBH					1.00 Ea.	
Unit values		6.00	1065.00	163.40	0.00	0.00	1228.40
Totals		6.00	\$1,065	\$163	\$0	\$0	\$1,228
1554510220	CO-RAY-VAC VANTAGE 2 INFA-RD HTG UNIT, GAS 40 MBH					4.00 Ea.	
Unit values		4.00	935.00	81.70	0.00	0.00	1016.70
Totals		16.00	\$3,740	\$327	\$0	\$0	\$4,067
1556800120	CO-RAY-VAC VANTAGE 2 VENT PIPE					5.00 Ea.	
Unit values		1.60	70.00	76.50	0.00	0.00	146.50
Totals		8.00	\$350	\$382	\$0	\$0	\$732
1574205220	ELECTRIC THERMOSTAT W/ COVER AND WIRING					6.00 Ea.	
Unit values		1.00	75.00	27.55	0.00	0.00	102.55
Totals		6.00	\$450	\$165	\$0	\$0	\$615

```
=====
Line #      Description
-----
           Manhours  Matl    Labor  Equipment  Sub      Total
=====
U15 MECHANICAL      272    $15,408    $6,286         $0         $0    $21,694
1631200100    HEATING SYSTEM POWER / CONTROL PANEL
Unit values      2.96    330.76    70.58    0.00      1.00 Ea.    401.34
Totals           2.96      $331      $71      $0         $0         $402

U16 ELECTRICAL      3      $331      $71      $0         $0         $402
=====
```

```
=====
Line #      Description
-----
      Manhours  Matl    Labor  Equipment  Sub    Total
=====
```

ESTIMATE TOTAL	344	\$16,758	\$8,461	\$0	\$0	\$25,219
SALES TAX	0.00%	\$0				
MATL MARKUP	0.00%	\$0				
LABOR MARKUP	0.00%		\$0			
EQUIPT MARKUP	0.00%			\$0		
SUB MARKUP	0.00%				\$0	
TOTAL BEFORE CONTINGENC		\$16,758	\$8,461	\$0	\$0	\$25,219
CONTINGENCY	0.00%					\$0
BOND	0.00%					\$0
PROFIT	0.00%					\$0
JOB TOTAL						\$25,219

```

=====
Estimate:      BLDG 6592          Date:      14-Oct-94
Description:    INFRARED HEATING SYSTEM COST ESTIMATE
Project:       LIMITED EEAP(GLASSBid Date:
Location:      FORT KNOX, KY      Job #:      94013.02
Sq. footage:   City indx:Louisville, KY
=====

```

## SUMMARY

```

=====
              Manhours   Matl      Labor   Equipment   Sub      Total
=====
A09 ELECTRICAL      69      $1,019    $2,104         $0         $0      $3,123
U15 MECHANICAL     272     $15,408    $6,286         $0         $0     $21,694
U16 ELECTRICAL       3        $331      $71          $0         $0       $402

TOTAL              344     $16,758    $8,461         $0         $0     $25,219

SALES TAX           0.00%         $0
MATL MARKUP         0.00%         $0
LABOR MARKUP        0.00%         $0
EQUIPT MARKUP       0.00%         $0
SUB MARKUP          0.00%         $0

TOTAL BEFORE CONTINGENC $16,758    $8,461         $0         $0     $25,219
CONTINGENCY          0.00%
BOND                 0.00%
PROFIT               0.00%

JOB TOTAL                                $25,219
=====

```

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

PAGE 1 OF 3

BUILDING NUMBER:	6592	BUILDING HEATING TEMPERATURE SETPOINT:	60 F
		OUTSIDE DESIGN TEMPERATURE	1 F
		TEMPERATURE DIFFERENCE	59 F
INFILTRATION LOSSES =	1	AIR CHGS X 138900 VOL (CU FT) X 59 F TEMP DIFF X 0.019	= 0.16 MBTU / HR
FLOOR LOSSES =	390	LINEAR FEET OF PERIMETER X 59 F TEMP DIFF X 0.81	= 0.02 MBTU / HR
SURFACE HEAT LOSSES			
FLAT BUILT UP ROOF =	8100	AREA (SF) X 0.105 U VALUE (BTU/HR - SF - F) X 59 F TEMPERATURE DIFFERENCE	= 0.05 MBTU / HR
FACE BRICK/BLK WALL =		AREA (SF) X 0.176 U VALUE (BTU/HR - SF - F) X 59 F TEMPERATURE DIFFERENCE	= 0.00 MBTU / HR
8" CINDER BLOCK WALL =	2743	AREA (SF) X 0.389 U VALUE (BTU/HR - SF - F) X 59 F TEMPERATURE DIFFERENCE	= 0.06 MBTU / HR
CORR MTL PNL WALL =	1685	AREA (SF) X 0.17 U VALUE (BTU/HR - SF - F) X 59 F TEMPERATURE DIFFERENCE	= 0.02 MBTU / HR
CLR SGL PANE WINDOWS =	760	AREA (SF) X 1.235 U VALUE (BTU/HR - SF - F) X 59 F TEMPERATURE DIFFERENCE	= 0.06 MBTU / HR
TINTED DBL PANE WIN'W =		AREA (SF) X 0.65 U VALUE (BTU/HR - SF - F) X 59 F TEMPERATURE DIFFERENCE	= 0.00 MBTU / HR
METAL ROLL UP DOORS =	1792	AREA (SF) X 0.56 U VALUE (BTU/HR - SF - F) X 59 F TEMPERATURE DIFFERENCE	= 0.06 MBTU / HR
METAL GLAZED O'HEAD DR =		AREA (SF) X 0.214 U VALUE (BTU/HR - SF - F) X 59 F TEMPERATURE DIFFERENCE	= 0.00 MBTU / HR
LG MTL SLIDING DOOR =		AREA (SF) X 0.56 U VALUE (BTU/HR - SF - F) X 59 F TEMPERATURE DIFFERENCE	= 0.00 MBTU / HR
METAL PERSONNEL DR =		AREA (SF) X 0.56 U VALUE (BTU/HR - SF - F) X 59 F TEMPERATURE DIFFERENCE	= 0.00 MBTU / HR
MTL/GLAZED PERSONNEL =	50	AREA (SF) X 0.615 U VALUE (BTU/HR - SF - F) X 59 F TEMPERATURE DIFFERENCE	= 0.00 MBTU / HR
TOTAL BASELINE HEAT LOSSES			= 0.42 MBTU / HR
			= 443.92 MJ/HR

# FT KNOX LIMITED EEAP (GLASS)

## ECO - 1: INFRARED HEATING CALCULATIONS

BUILDING NUMBER: 6592										BUILDING HEATING TEMPERATURE SETPOINT: 55 F											
										OUTSIDE DESIGN TEMPERATURE 1 F											
										TEMPERATURE DIFFERENCE 54 F											
INFILTRATION LOSSES =										1	AIR CHGS	X	138900	VOL (CU FT)	X	54 F TEMP DIFF	X	0.019	=	0.14	MBTU / HR
FLOOR LOSSES =										390	LINEAR FEET OF PERIMETER		X	54 F TEMP DIFF	X	0.81	=	0.02	MBTU / HR		
SURFACE HEAT LOSSES																					
FLAT BUILT UP ROOF =										8100	AREA (SF)	X	0.105	U VALUE (BTU/HR - SF - F)	X	54 F TEMP DIFFERENCE	=	0.05	MBTU / HR		
FACE BRICK/BLK WALL =										0	AREA (SF)	X	0.176	U VALUE (BTU/HR - SF - F)	X	54 F TEMP DIFFERENCE	=	0.00	MBTU / HR		
8" CINDER BLOCK WALL =										2743	AREA (SF)	X	0.389	U VALUE (BTU/HR - SF - F)	X	54 F TEMP DIFFERENCE	=	0.06	MBTU / HR		
CORR MTL PNL WALL =										1685	AREA (SF)	X	0.17	U VALUE (BTU/HR - SF - F)	X	54 F TEMP DIFFERENCE	=	0.02	MBTU / HR		
CLR SGL PANE WINDOWS =										760	AREA (SF)	X	1.235	U VALUE (BTU/HR - SF - F)	X	54 F TEMP DIFFERENCE	=	0.05	MBTU / HR		
TINTED DBL PANE WIN"W =										0	AREA (SF)	X	0.65	U VALUE (BTU/HR - SF - F)	X	54 F TEMP DIFFERENCE	=	0.00	MBTU / HR		
METAL ROLL UP DOORS =										1792	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	54 F TEMP DIFFERENCE	=	0.05	MBTU / HR		
WOOD GLAZED O'HEAD DR =										0	AREA (SF)	X	0.214	U VALUE (BTU/HR - SF - F)	X	54 F TEMP DIFFERENCE	=	0.00	MBTU / HR		
LG MTL SLIDING DOOR =										0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	54 F TEMP DIFFERENCE	=	0.00	MBTU / HR		
METAL PERSONNEL DR=										0	AREA (SF)	X	0.56	U VALUE (BTU/HR - SF - F)	X	54 F TEMP DIFFERENCE	=	0.00	MBTU / HR		
MTL/ GLAZED PERSONNEL=										50	AREA (SF)	X	0.615	U VALUE (BTU/HR - SF - F)	X	54 F TEMP DIFFERENCE	=	0.00	MBTU / HR		
TOTAL ECO HEAT LOSSES																					
										=	0.39	MBTU / HR									
										=	406.30	MJ/HR									

## ECO - 1: INFRARED HEATING CALCULATIONS

**PAGE 3 OF 3**

	BASELINE	ECO - 1	BUILDING NUMBER	6592
SYSTEM EFFICIENCY	60%	90%	GLOSSARY OF TERMS  1 MBTU = 1055 MJ 0.019=CONSTANT .81 = CONSTANT FOR SLAB PERIMETER UNINSULATED FROM ASHRAE CORR FACTOR = EMPIRICAL CORRECTION FACTOR FOR HEATING EFFECT VS 65 F DEGREE-DAYS FROM ASHRAE FUNDAMENTALS 1989 PG28.2	
OUTSIDE DESIGN TEMP (F)	1	1		
HTG TEMP SETPOINT (F)	60	55		
HEATING DEGREE DAYS	4616	3396		
TOTAL HEAT LOSSES (MBTU / HR)	0.42	0.39		
\$ /MBTU -FUEL OIL	\$6.60	\$6.60		
\$ /MBTU -NATURAL GAS	\$4.62	\$4.62		
\$ /MBTU -PPG	\$10.84	\$10.84		

## ANNUAL HEATING ENERGY CONSUMPTION (DEGREE DAY METHOD)

[illegible]

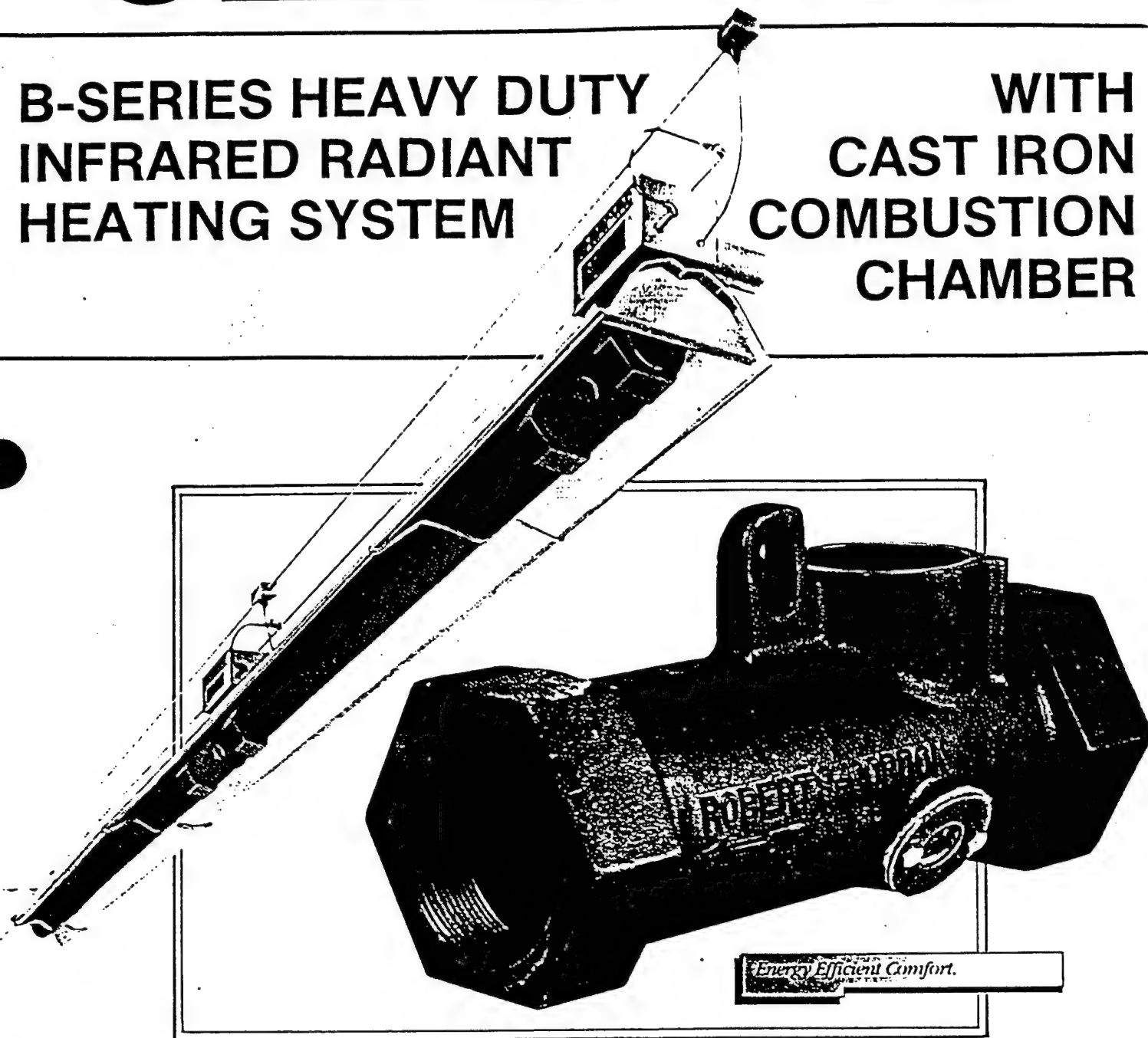
## ANNUAL HEATING ENERGY COST

BASELINE =	1,316.82	MBTU / YR X	4.62	\$ /MBTU	=	6,083.73	\$ /YR
ECO - 1 =	645.86	MBTU / YR X	4.62	\$ /MBTU	=	2,983.87	\$ /YR
ECO - 1 ANNUAL HEATING ENERGY COST SAVINGS = 3,099.85 \$ /YR							

# CO-RAY-VAC<sup>®</sup> CLASSIC

**B-SERIES HEAVY DUTY  
INFRARED RADIANT  
HEATING SYSTEM**

**WITH  
CAST IRON  
COMBUSTION  
CHAMBER**

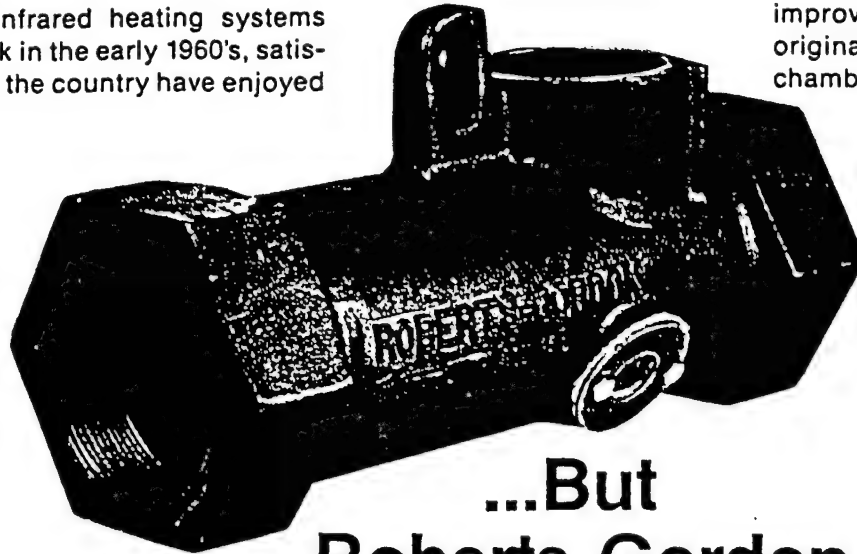


**CO-RAY-VAC "Classic" B-Series Heavy Duty Systems Feature Cast Iron Combustion Chambers, Burners, Vacuum Pump Housing & Schedule 40 Pipe to Combine "Built Like They Used To" Durability with the Latest in Modern Gas Combustion Technology.**

**15-YEAR  
WARRANTY\***

## Everyone Says, "They Don't Build Them Like They Used To..."

Since CO-RAY-VAC infrared heating systems were first installed back in the early 1960's, satisfied customers around the country have enjoyed years of trouble-free operation with our heavy duty cast iron heating systems. Everyone says, "They don't build them like they used to,"...But Roberts-Gordon does. CO-RAY-VAC heavy duty systems are still available today. They feature all the modern

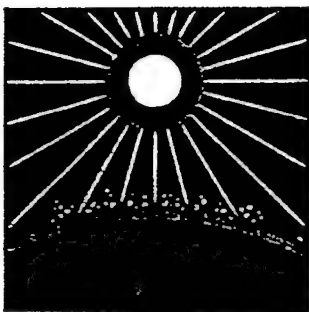


improvements, but keep the original cast iron combustion chamber, burners and vacuum pump housing for rugged durability and top performance year after year. Offered exclusively by Roberts-Gordon, the CO-RAY-VAC "Classic" heavy duty series is especially suited for installations where an extended lifetime of trouble-free service is desired.

## ...But Roberts-Gordon Does!

\* Roberts-Gordon cast iron combustion chambers and vacuum pump housing are warranted for 15 years against manufacturing defects and defects in workmanship.

## CO-RAY-VAC Gas-Fired, Fully Vented, Low-Intensity Radiant Heating System



### How Infrared Heating Works

High-efficiency CO-RAY-VAC heating systems warm the workplace in the same manner as the sun heats the earth. Like the sun, CO-RAY-VAC produces infrared rays. These low-intensity rays are directed downward by specially designed reflectors to spread a draftless blanket of warmth that heats the floor, people and objects directly. The warm floor and objects then release heat to warm the air. Since solid objects, not the air, are heated directly, people are comfortable at lower building thermostat settings.

### Outstanding Efficiency, Comfort and Savings

**Design-Certified by the American Gas Association.**

**Outstanding Energy Efficiency**—Independently tested Annual Fuel Utilization (AFUE) rating of 90.43%.

**Fuel Cost Savings**—Customers document savings up to 50% and more on their annual heating costs.

**Low Maintenance**—Cast iron combustion chambers, burners & vacuum pump housings are especially designed for trouble-free service.

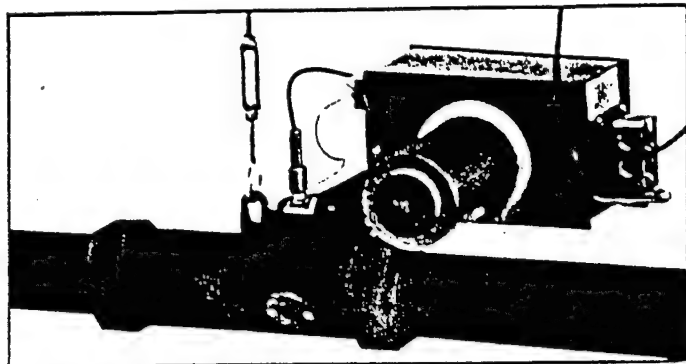
**Clean, Quiet, Draft-Free, Uniform Heat**—CO-RAY-VAC spreads heat evenly over large areas without noise, drafts or blasts of hot air. No swirling dust or grit, and no interference with your operations.

**Greater Worker Comfort & Productivity**—Because of the principle of CO-RAY-VAC infrared heating, employees are more comfortable in more favorable conditions. This can boost morale and productivity!

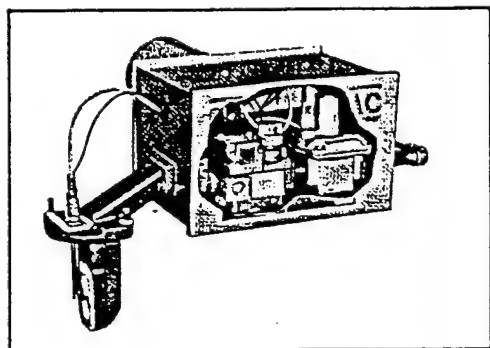
**Faster Heat Recovery**—Floor and objects act as heat reservoirs, giving off heat and providing fast heat recovery when large doors are closed.

# These are the features of the CO-RAY-VAC Heavy Duty Systems...

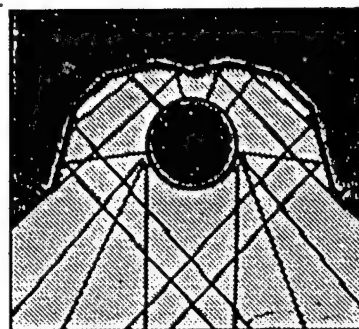
- Burners in series; wide range of inputs from 20,000 to 120,000 BTU for high and low mounting heights.



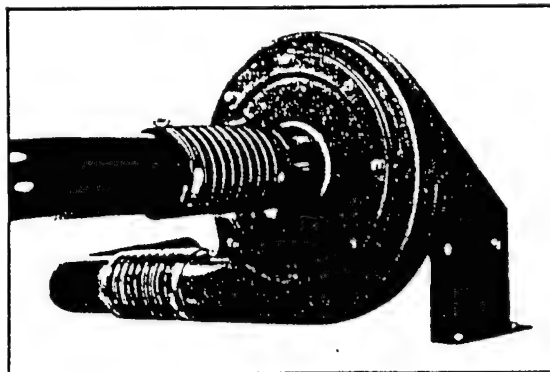
- Heavy duty cast iron combustion chamber for durability and long life.



- Cast iron burner and modern direct spark electronic ignition systems eliminate standing pilots and are compatible with state-of-the-art temperature control systems.



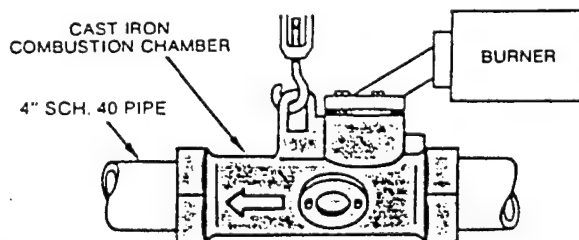
- Deep dish reflectors and perimeter reflectors maximize radiant output in all types of buildings.



- Totally enclosed vacuum pump motor for superior, trouble-free operation even in the most severe building environments.
- Can be suspended up to 60 ft. or more from the floor to clear gantry cranes, high rising equipment, etc.
- Fully vented, uses natural or propane gas.

## CO-RAY-VAC Heavy Duty Systems

Similar to standard CO-RAY-VAC system, but standard steel combustion chamber and standard radiant tube replaced with cast iron combustion chamber and schedule 40 steel radiant pipe.



### SPECIFICATIONS

MODEL	CRV-B2	CRV-B4	CRV-B6	CRV-B8	CRV-B10	CRV-B12
GAS INPUT, BTU/HR.	20,000	40,000	60,000	80,000	100,000	120,000

### CLEARANCES TO COMBUSTIBLES WITH STANDARD REFLECTOR

ABOVE	4"	4"	4"	4"	4"	4"
BELOW	48"	48"	48"	48"	60"	60"
SIDE	20"	20"	20"	20"	36"	36"

# Here are just a few installations Nationwide in which CO-RAY-VAC Heavy Duty Cast Iron Combustion Chambers have

## provided dependable service for 15 years or more.

Marplex Products Co., Inc.

June 9, 1987

Mr. Harold Steineke  
Wisconsin Instrument & Control, Inc.  
3196 N. Main Street  
Oshkosh, WI 54901

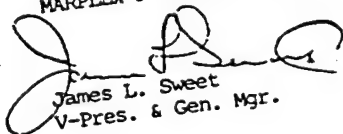
Dear Mr. Steineke:

It is interesting to discover that Marplex's  
Co-Ray-Vac heating system was the first  
installation in Wisconsin and also one of the  
first in the country.

I am pleased to advise you that our system  
works very well even after 25 years.  
Our maintenance is minimal and we are looking  
forward to the next quarter century of operation.

Sincerely,

MARPLEX PRODUCTS CO., INC.

  
James L. Sweet  
V-Pres. & Gen. Mgr.

JLS:mah

Rhineland, Wisconsin 54501. (716) 362-3193

Breach Mold & Tool  
New Albany, IN

Brennan Marine  
Bay City, MI

Clover Park Technical School  
Tacoma, WA

Dakota Block Company  
Rapid City, SD

Daytona Country Club  
Dayton, MN

Hass Cabinet Company  
Sellersburg, IN

La Choy Food Products  
Archbold, OH

Lang Manufacturing  
Redmond, WA

Rail's Autobody Repair  
Belle Fourche, SD

Rice County Highway Department  
Fairbault, MN

Robinson Welding  
Livonia, MI

Sauder Woodworking Company  
Archbold, OH

Scott Electric  
Greensburg, PA

Stoddard Aero Service  
Anchorage, AK

Tower Tool Company  
Fraser, MI

White Castle Systems  
Carteret, NJ

William Britland Auto Body, Inc.  
Green Brook, NJ



**CO-RAY-VAC**

Division of  
**Roberts-Gordon, Inc.**

Subsidiary of A.J. Industries Inc.  
1250 William Street • P.O. Box 44 • Buffalo, NY 14240  
Phone: (716) 852-4400 • FAX: (716) 852-0854



**RODNEY WILL, INC.**

Manufacturers' Representative

2104 NORTHFIELD DRIVE  
LOUISVILLE, KENTUCKY 40222

PHONE 502 425-3561

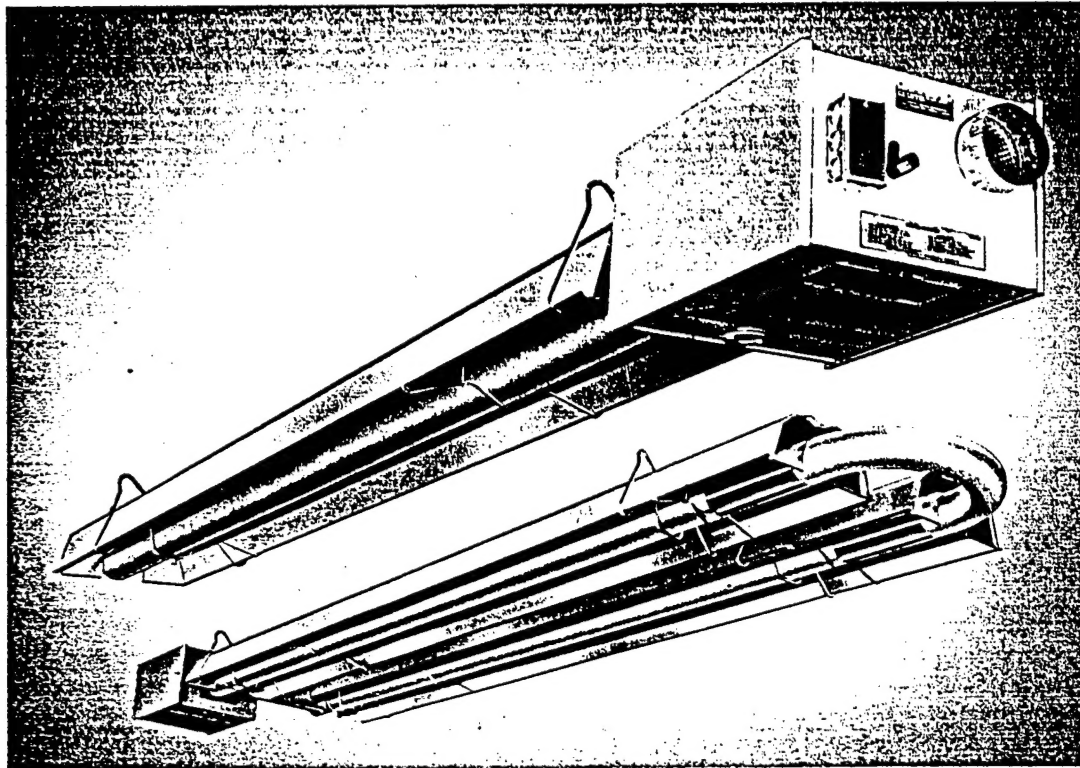
FAX 502 425-3012

CALL TOLL FREE: 1-800-828-7450  
IN NEW YORK STATE: 1-800-221-0955

# VANTAGE II<sup>®</sup>

*Cost-Saving,  
Low-Intensity Infrared  
Unitary Heaters*

RODNEY WILL, INC.  
Manufacturers' Representative  
2104 NORTHFIELD DRIVE  
LOUISVILLE, KENTUCKY 40222  
PHONE 502 425-3581  
FAX 502 425-3012



## Roberts-Gordon, Inc.

*Energy Efficient Comfort.*

# VANTAGE II Unitary Heaters

## Lower Fuel Costs and Raise Comfort Levels.

### Demonstrated Savings

Modern gas combustion technology combined with the principles of infrared energy enable VANTAGE II heaters to reduce fuel costs substantially while improving comfort conditions. Users report heating bills cut by up to 50% or more!

### Low Cost...Easy to Install and Maintain

The VANTAGE II models are low-cost, field-assembled infrared heaters that are easy to install and require only minimal maintenance. They are designed to provide years of economical operation and trouble-free service.

### Versatility

VANTAGE II heaters can be installed separately or in combination to fit any floor plan. Straight, L- and U-tube configurations are available. Tube lengths are offered from 10 through 60 feet. Ideal for large areas as well as hard-to-heat spaces!

### Reliability and Expertise

Roberts-Gordon pioneered low-intensity infrared heating systems in 1962 and manufactures the broadest line of low-intensity heating equipment in North America. Backed by a limited three-year warranty, each VANTAGE II unitary heater is built to uphold the well-established Roberts-Gordon standards of engineering excellence, efficiency and reliability.

## Applications Include:

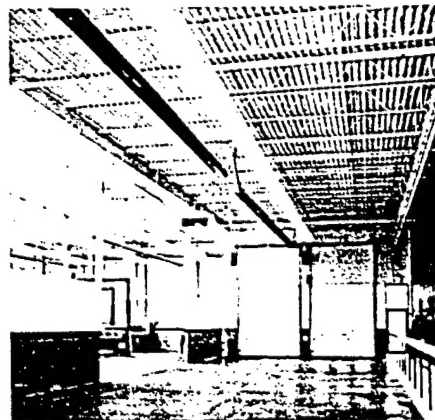
- Automotive Facilities
- Warehouses
- Manufacturing Facilities

- Fire Stations
- Agricultural Buildings
- Recreational Facilities

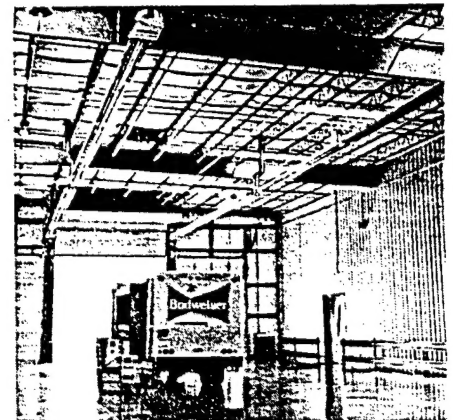
- Machine Shops
- Aircraft Hangars
- Vehicle Maintenance Buildings



Clean, quiet, draft-free Vantage radiant heat is ideal for automotive service facilities. Unlike forced-air unit heaters, Vantage does not spread dirt, grit or dust.



Vantage unitary heaters are available in a variety of lengths, shapes and configurations to fit any floor plan. Two straight-tube models are shown above in a car dealership.



Floors are kept warm by Vantage infrared energy and act as heat reservoirs to provide rapid heat recovery after bay doors are closed in this warehouse/shipping area.

## Features:

- Extensive use of corrosion-resistant materials.
- Weight-saving construction to ease installation.
- Forced draft design eliminates the need for a heat-siphoning draft hood.
- 10 through 60 foot tube lengths.
- Clean, quiet, draft-free heat.
- Three-year limited warranty on all components.
- A.G.A. design certified.

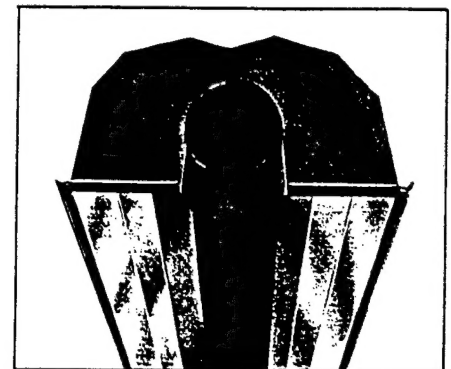
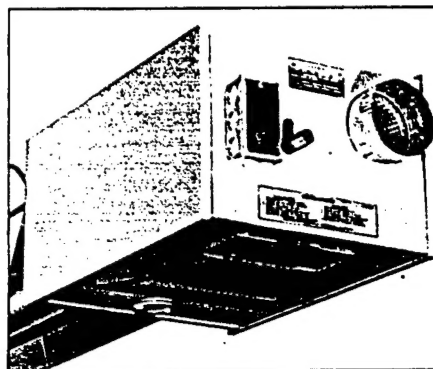
## Burner Box:

- 40,000; 60,000; 80,000; 100,000; 125,000 and 150,000 BTU/Hr. models available.
- Natural gas and L.P. models available.
- Moisture-resistant design.
- Nickel plated steel burner cup.
- Outside air adapter standard.
- Hot surface ignition.
- Three-try ignition module.
- Door interlock safety switch.
- All components easily accessed.
- Electrostatically applied paint.
- Durable spot welded construction.
- Mica flame observation window.
- Balanced air rotor.
- Stainless steel flex gas line and high pressure gas cock included.

## Tube and Reflector:

- 4" diameter 16-gauge tubing.
- Quick assembly couplings.
- Deep-dish aluminum reflectors maximize energy reflection, beaming virtually all of the radiant heat downward.
- Reflectors can be tilted 45° to direct heat where needed.
- Entire U-tube heater also can be tilted 45°.
- End caps included.
- Nickel plated hangers.
- Chrome plated hardware.
- Flue connector included.
- 180° U-package option.
- 90° L-package option.
- Decorative grille option.
- Side reflector option.

"The VANTAGE II heater utilizes design concepts and engineering principles proven by more than 25 years of infrared heating experience."



## Architectural/Engineering Short Form Specifications VANTAGE II CTH2 Series

Gas-fired, vented, infrared heaters shall be furnished and installed in accordance with governing codes and as shown per building drawing(s) as described below.

Heaters shall be VANTAGE II, model number CTH2- \_\_\_\_\_, \_\_\_\_\_ BTU/Hr. as manufactured by Roberts-Gordon, Inc., Buffalo, New York.

Heaters shall be equipped with a direct sense silicon-carbide hot surface ignition control system with 100% shut-off ignition device. Power supplied to each heater shall be 120V, 60Hz, 10. Heater to be equipped with totally enclosed motor with thermal overload motor protection, balanced air rotor, combustion air proving safety pressure switch, nickel plated burner cup, combustion chamber equipped with sight glass for visual inspection of igniter element and burner flame. Air intake collar standard. Radiant tube assembly to be 4" diameter, aluminized steel first 10 feet. Hot rolled steel remainder of unit. (Or at customer option, aluminized steel for entire tube length.) Reflector to be of aluminum material and designed to direct all radiant output below horizontal centerline of radiant tube. Heaters shall be vented in accordance with manufacturer's recommendations as approved by A.G.A. and ANSI Z-223.1 National Fuel Gas Code. Heaters shall be so designed to operate without requiring heater modifications or adjustments on \_\_\_\_\_ gas having a net heating value of \_\_\_\_\_ BTU per cubic foot and a specific gravity of \_\_\_\_\_.

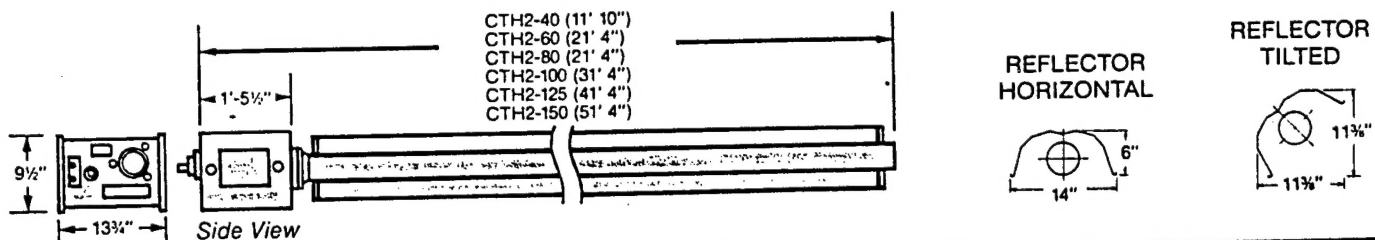
Heaters shall be Design Certified by the American Gas Association (A.G.A.). Supplier shall provide a manufacturer's written warranty covering all components for a period of three (3) years.

# VANTAGE II<sup>®</sup> CTH2 SERIES SPECIFICATIONS

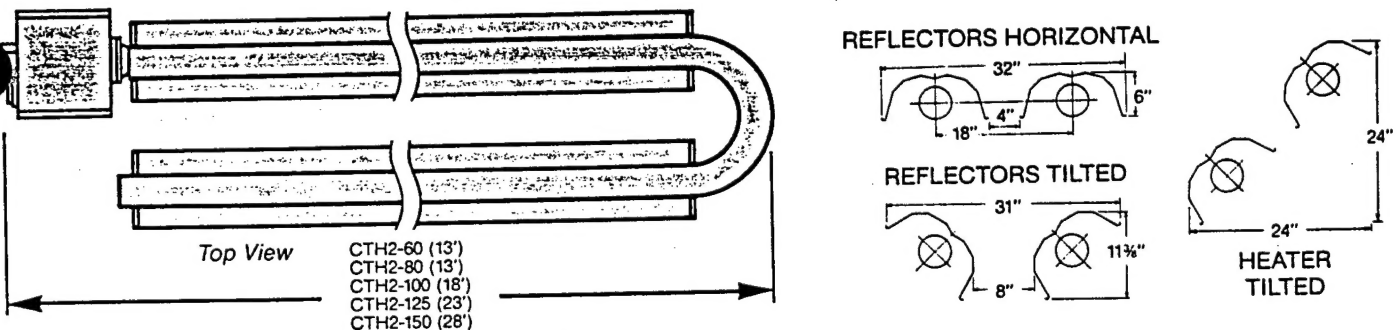
FLUE CONNECTION	GAS CONNECTION	ELECTRICAL RATING	TUBE DIAMETER	IGNITION SYSTEM	MIN. GAS INLET PRES.
4" (O.D.)	1/2" NPT	120VAC, 60Hz. 1.0 amp run 5.0 amp start	4"	Hot surface (Three-try)	Nat. 4.6" W.C. L.P. 11.0" W.C.

MODEL	BTU/Hr. (Natural Gas or L.P.)	SHIPPING WEIGHT	MODEL	BTU/Hr. (Natural Gas or L.P.)	SHIPPING WEIGHT
CTH2-40	40,000	95 lbs.	CTH2-100	100,000	165 lbs.
CTH2-60	60,000	130 lbs.	CTH2-125	125,000	200 lbs.
CTH2-80	80,000	130 lbs.	CTH2-150	150,000	235 lbs.

## DIMENSIONS (Standard Models) STRAIGHT



## U-TUBE



## CLEARANCES TO COMBUSTIBLES\*

Configuration	Reflector	CTH2-40			CTH2-60			CTH2-80			CTH2-100			CTH2-125			CTH2-150		
		Top	Below	Side	Top	Below	Side	Top	Below	Side	Top	Below	Side	Top	Below	Side	Top	Below	Side
Straight	Horizontal	4"	50"	22"	4"	60"	30"	4"	63"	33"	4"	68"	35"	4"	74"	41"	4"	77"	45"
Straight	Tilted	4"	45"	4"/42"	4"	54"	4"/50"	4"	60"	4"/56"	6"	68"	4"/60"	6"	72"	4"/65"	8"	78"	4"/70"
U-Tube	Horizontal	—	—	—	4"	60"	25"/30"	4"	66"	32"/33"	4"	73"	34"/35"	4"	76"	38"/41"	4"	81"	42"/45"
U-Tube	Tilted	—	—	—	4"	54"	18"/50"	4"	60"	18"/56"	6"	68"	18"/60"	6"	72"	18"/66"	8"	78"	18"/70"

Configuration	Heater	Top	Below	Side	Top	Below	Side	Top	Below	Side	Top	Below	Side	Top	Below	Side	Top	Below	Side
U-Tube	Tilted	—	—	—	4"	54"	4"/38"	4"	60"	4"/42"	4"	68"	4"/48"	4"	72"	4"/57"	4"	78"	4"/62"

\*See installation manual for complete information.



**Roberts-Gordon, Inc.**

P.O. Box 44 • Buffalo, NY 14240-0044  
Phone: (716) 852-4400 • Fax: (716) 852-0854



CALL TOLL FREE: 1-800-828-7450  
IN NEW YORK: 1-800-221-0955